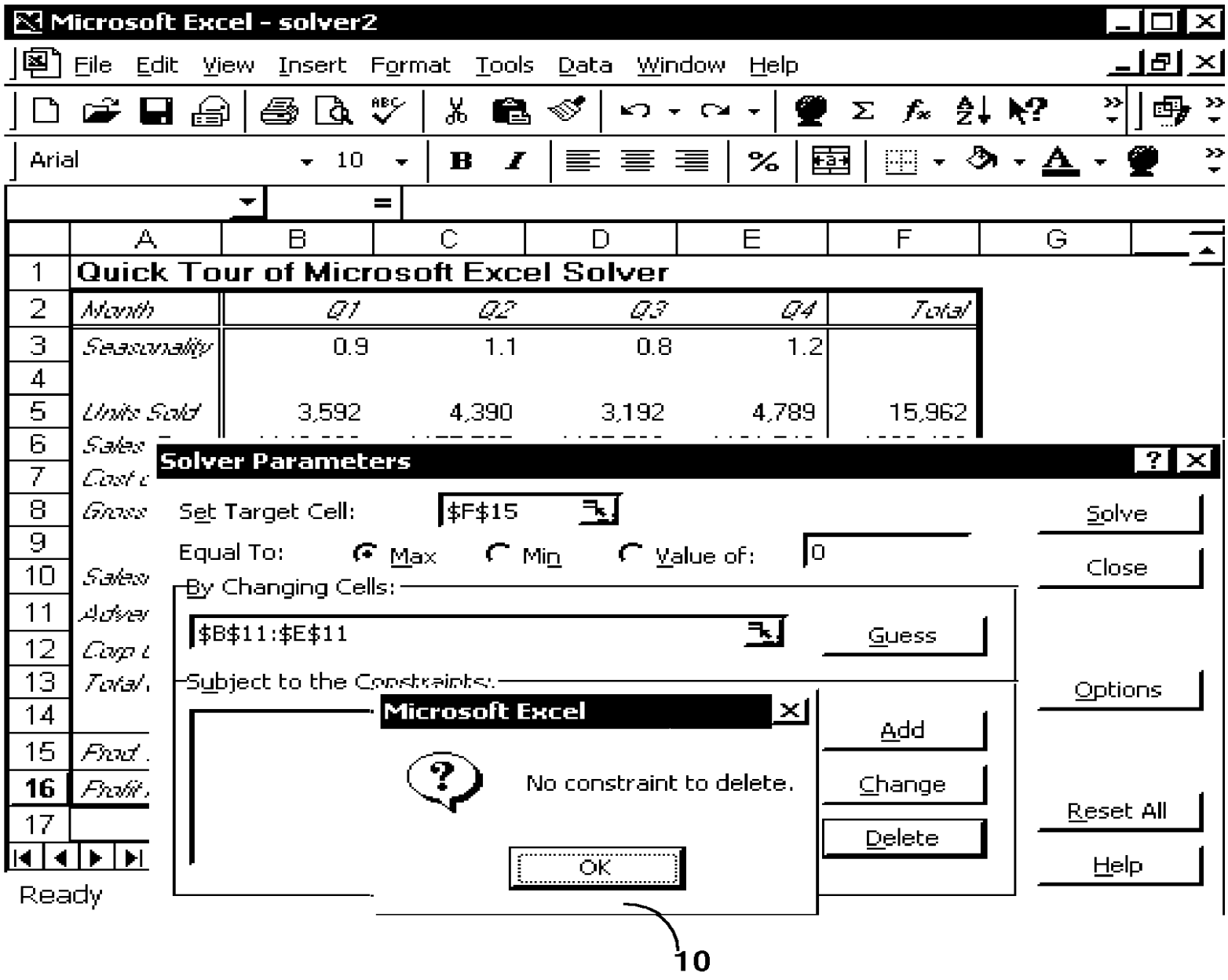

Microsoft Excel - solver2
File Edit View Insert Format Tools Data Window Help
Arial 10
Quick Tour of Microsoft Excel Solver
Month Q1 Q2 Q3 Q4 Total
Seasonality 0.9 1.1 0.8 1.2
Units Sold 3,592 4,390 3,192 4,789 15,962
Solver Parameters
Set Target Cell: $F$15
Equal To: Max Min Value of: 0
By Changing Cells:
$B$11:$E$11
Subject to the Constraints:
Microsoft Excel
No constraint to delete.
OK
Solve
Close
Guess
Options
Add
Change
Reset All
Delete
Help
Ready
10

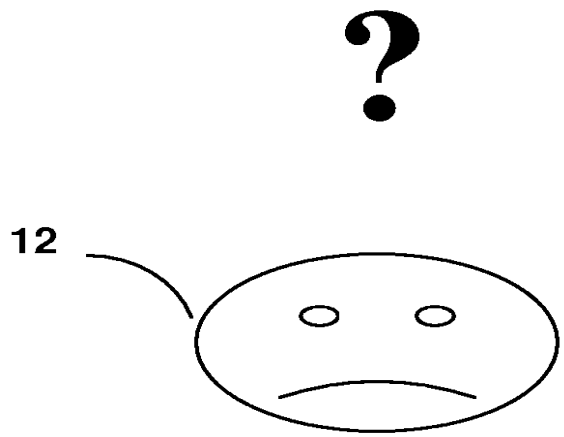
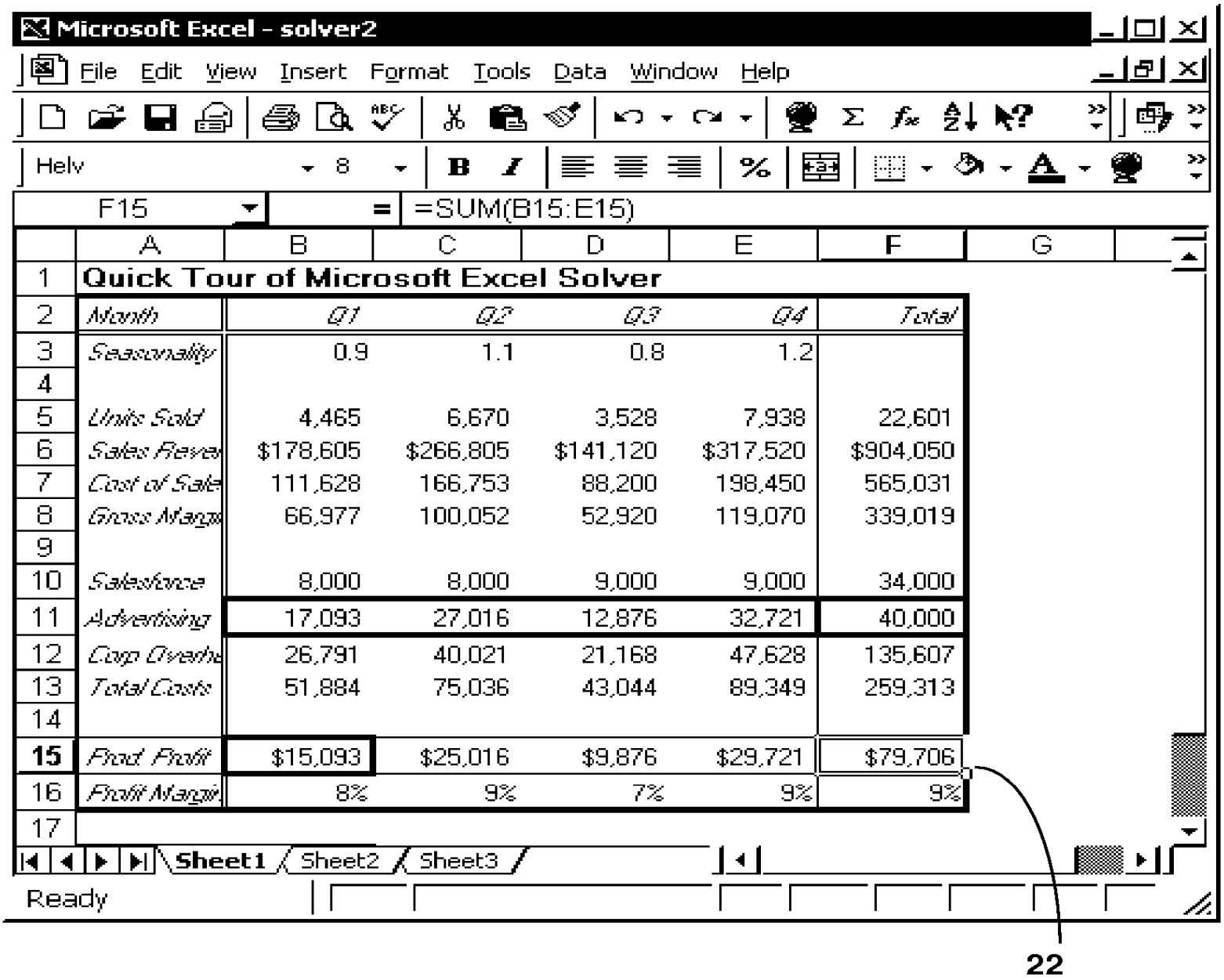

?
12

FIG. 1A


Microsoft Excel - solver2
File Edit View Insert Format Tools Data Window Help
Helv 8
F15
=SUM(B15:E15)
Quick Tour of Microsoft Excel Solver
Month | Q1 | Q2 | Q3 | Q4 | Total
Seasonality | 0.9 | 1.1 | 0.8 | 1.2
Units Sold | 4,465 | 6,670 | 3,528 | 7,938 | 22,601
Sales Reven | $178,605 | $266,805 | $141,120 | $317,520 | $904,050
Cost of Sale | 111,628 | 166,753 | 88,200 | 198,450 | 565,031
Gross Margi | 66,977 | 100,052 | 52,920 | 119,070 | 339,019
Salesforce | 8,000 | 8,000 | 9,000 | 9,000 | 34,000
Advertising | 17,093 | 27,016 | 12,876 | 32,721 | 40,000
Corp Overhe | 26,791 | 40,021 | 21,168 | 47,628 | 135,607
Total Costs | 51,884 | 75,036 | 43,044 | 89,349 | 259,313
Prod Profit | $15,093 | $25,016 | $9,876 | $29,721 | $79,706
Profit Margi | 8% | 9% | 7% | 9% | 9%
Sheet1 Sheet2 Sheet3
Ready
22

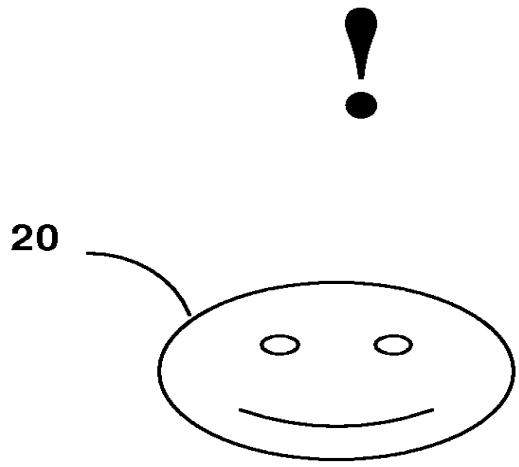

!
20

FIG. 1B

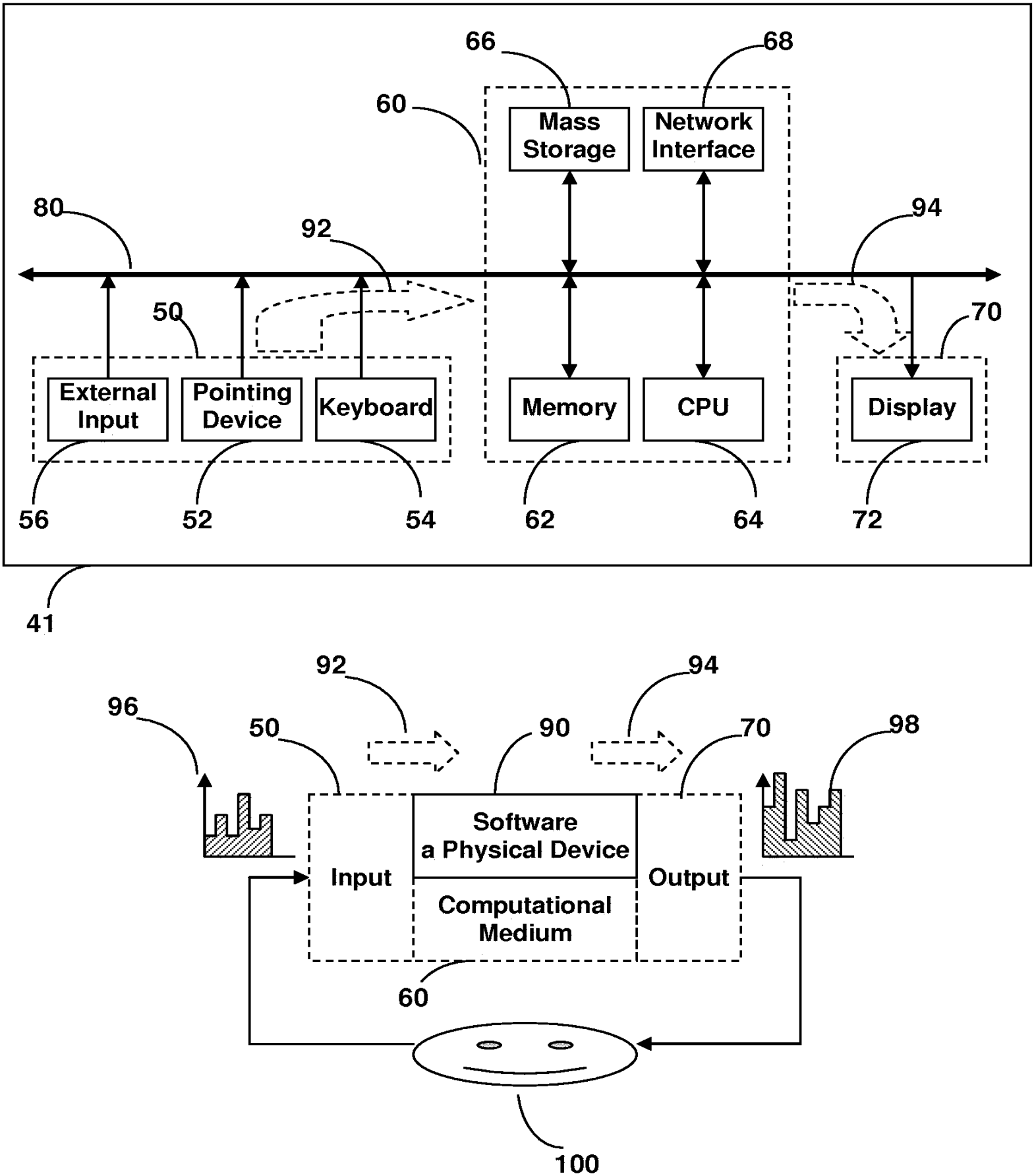

66
68
60
Mass Storage
Network Interface
80
92
94
50
70
External Input
Pointing Device
Keyboard
Memory
CPU
Display
56
52
54
62
64
72
41
92
94
96
50
90
70
98
Software a Physical Device
Input
Output
Computational Medium
60
100

FIG. 1C

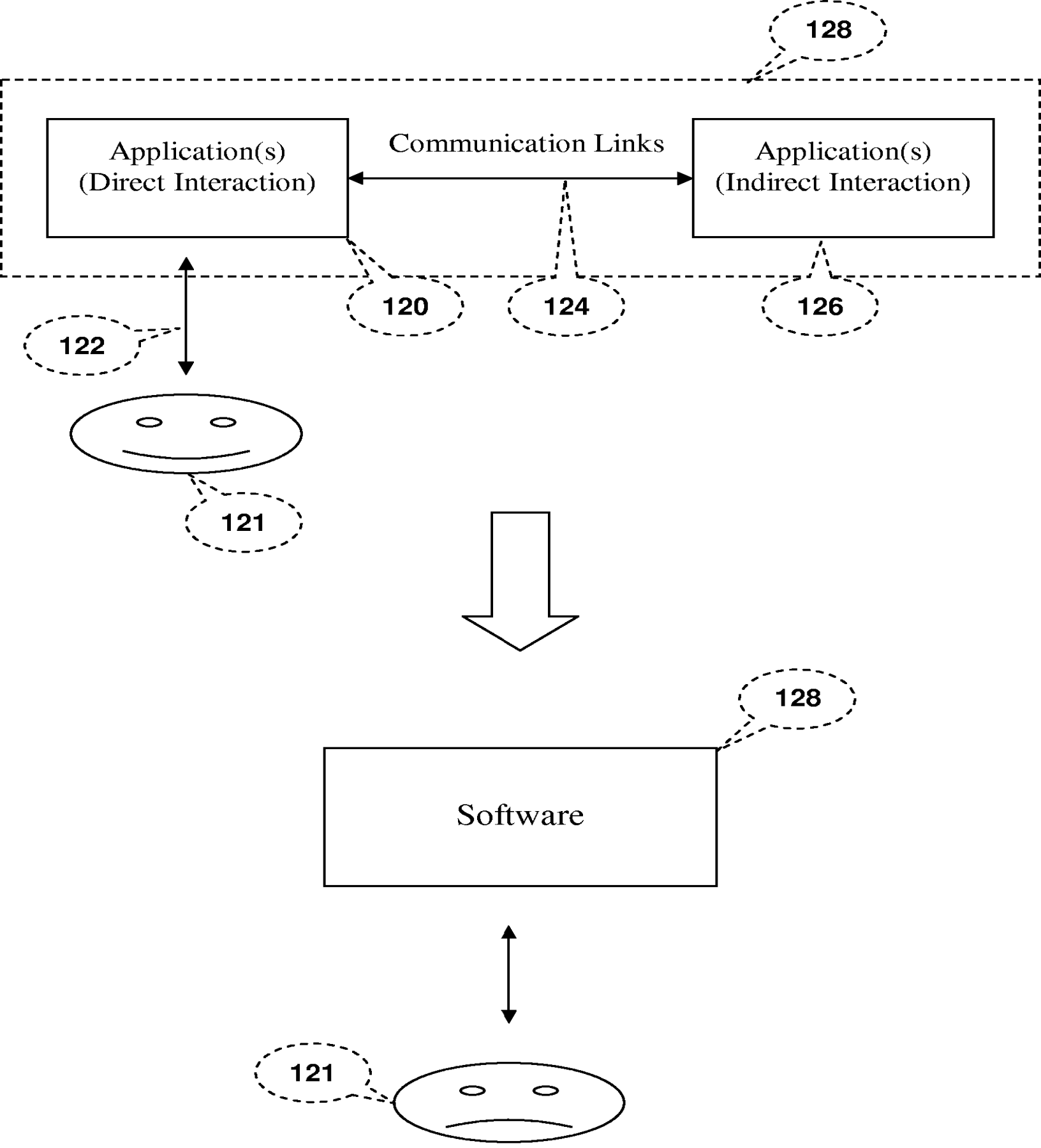
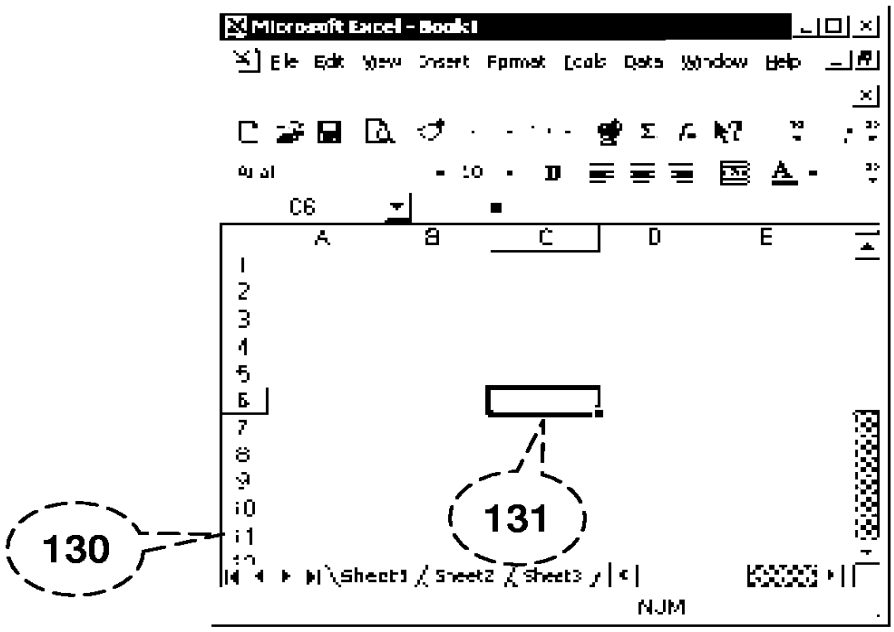

128
Application(s)
(Direct Interaction)
Communication Links
Application(s)
(Indirect Interaction)
120
124
126
122
121
128
Software
121

FIG. 2A


Microsoft Excel - Book1
File Edit View Insert Format Tools Data Window Help
C6
A
B
C
D
E
Sheet1
Sheet2
Sheet3
NUM
130
131

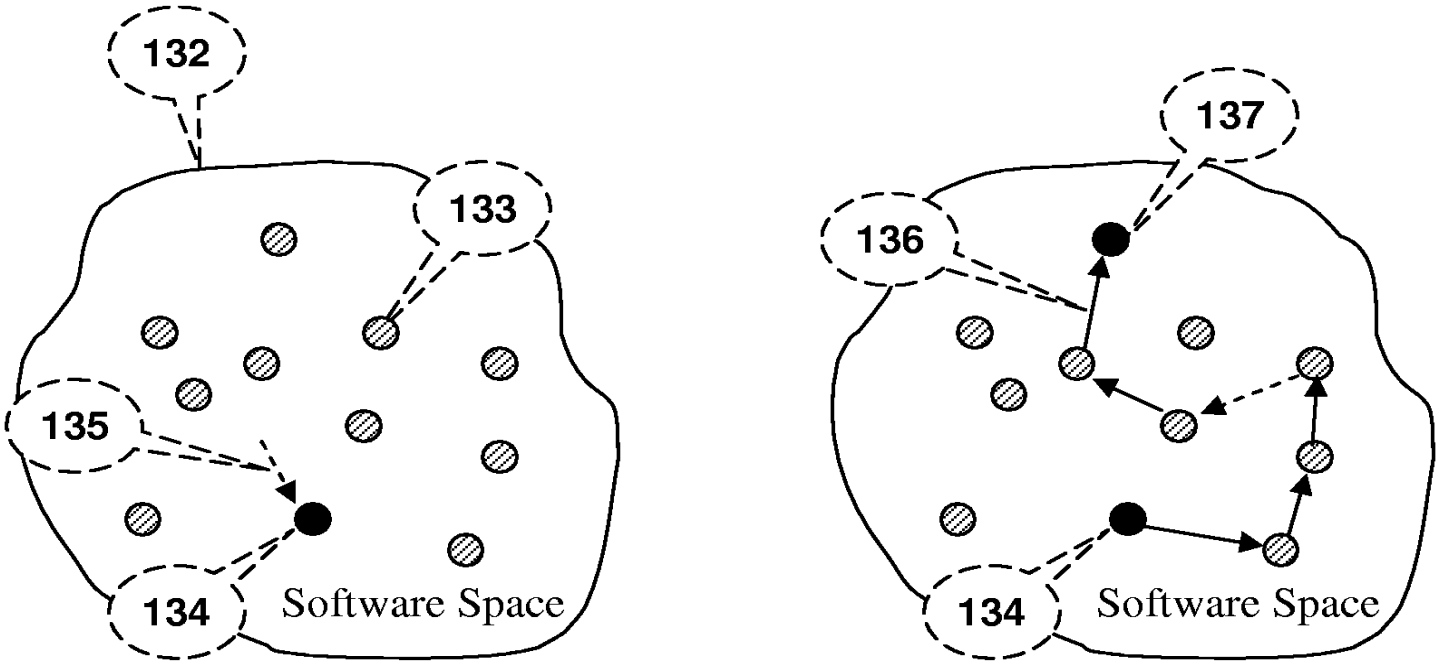
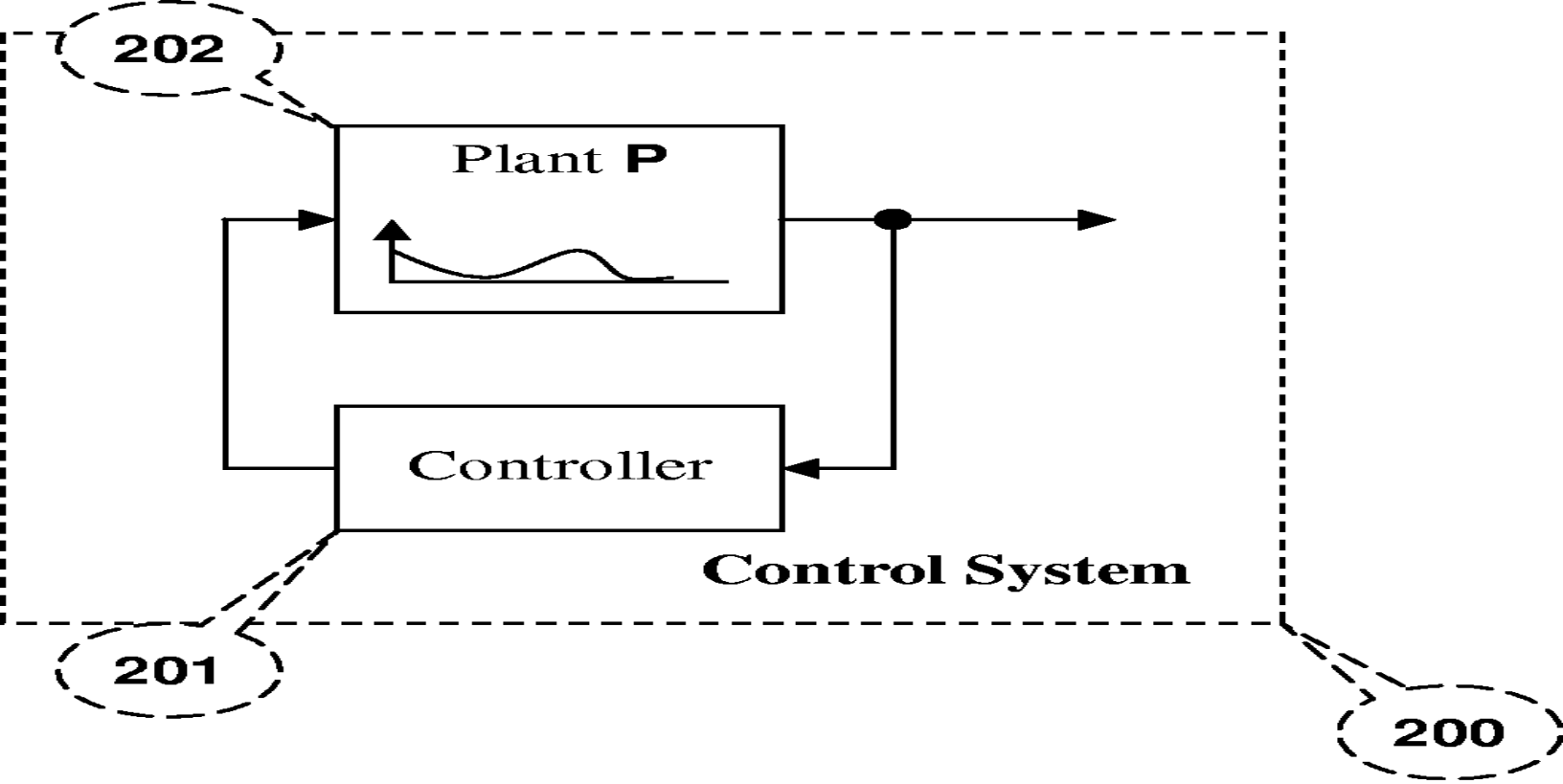

132
133
135
134
Software Space
137
136
134
Software Space

FIG. 2B


202
Plant P
Controller
Control System
201
200

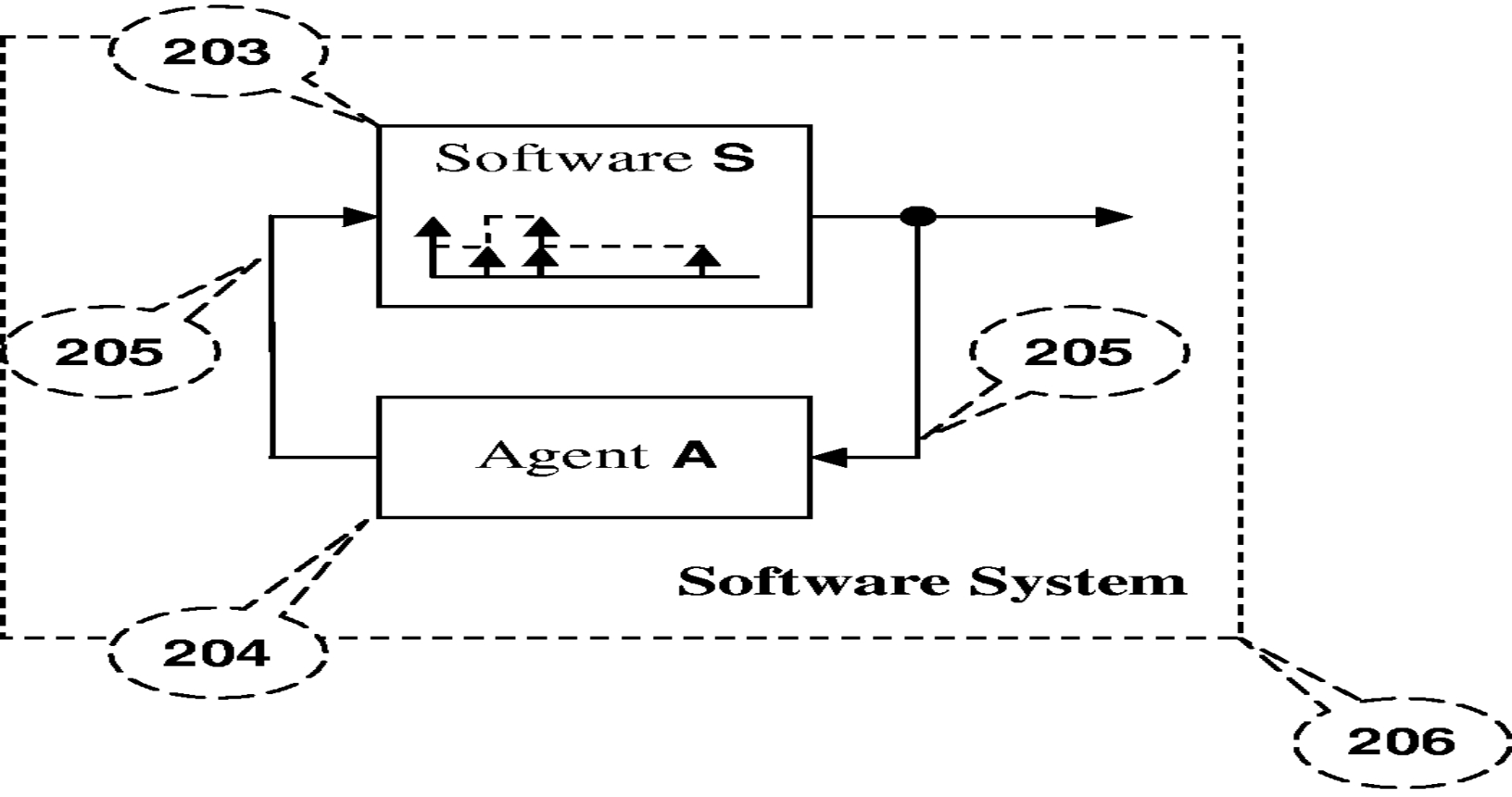

203
Software S
205
205
Agent A
Software System
204
206

FIG. 2C

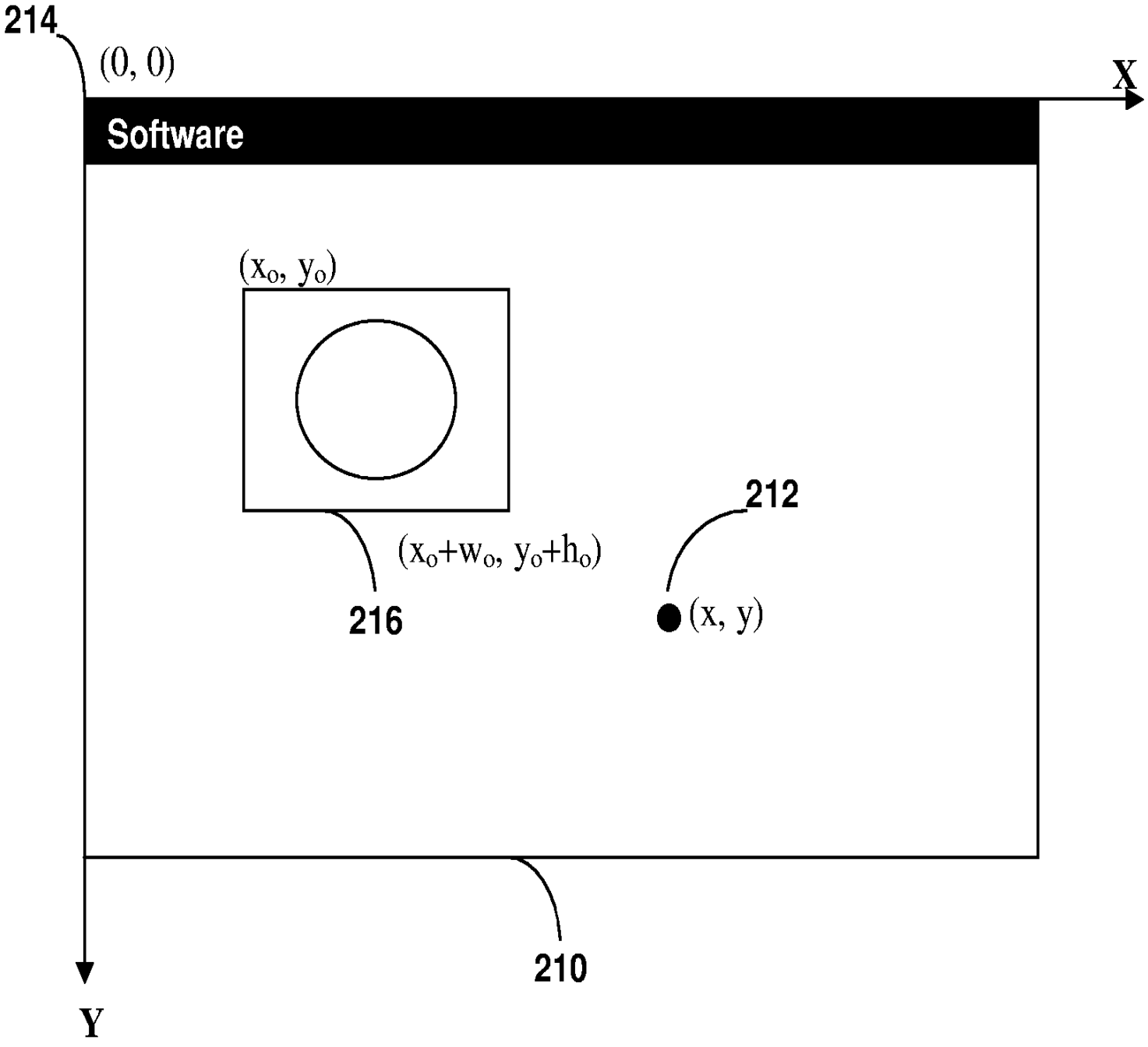
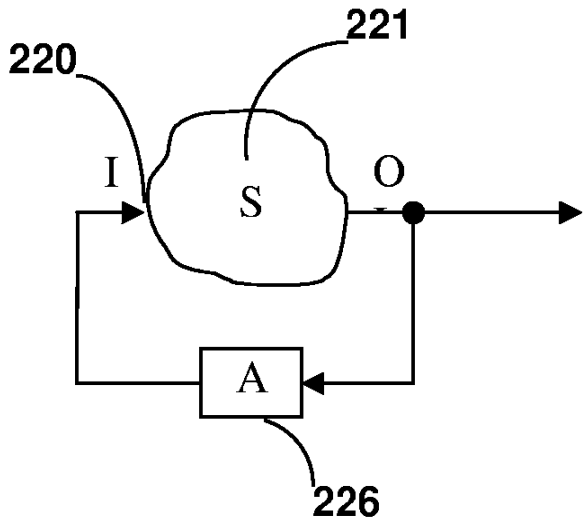


FIG. 2D


220
221
I
S
O
A
226

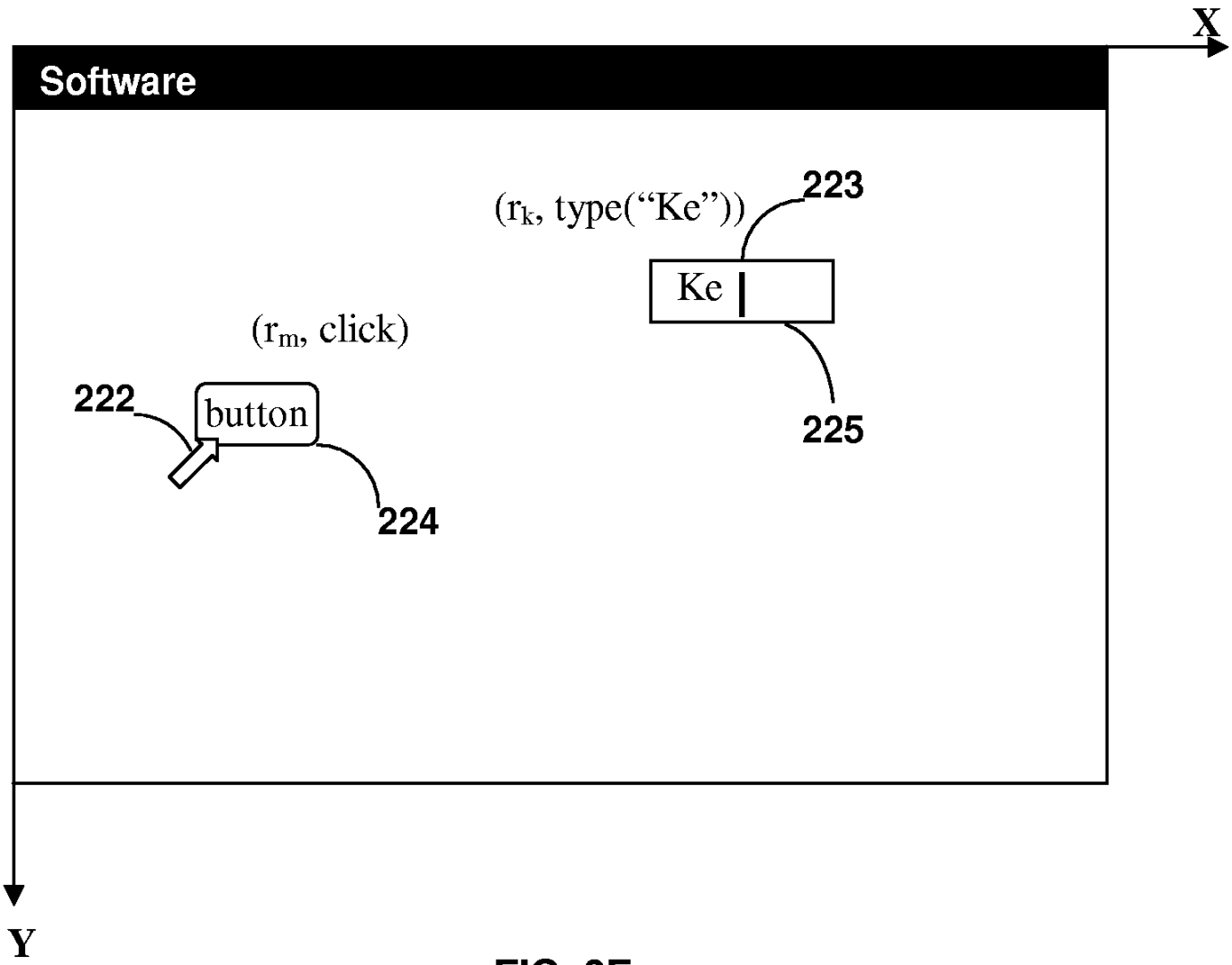

X
Software
(rk, type("Ke"))
223
Ke
(rm, click)
222
button
224
225
Y

FIG. 2E

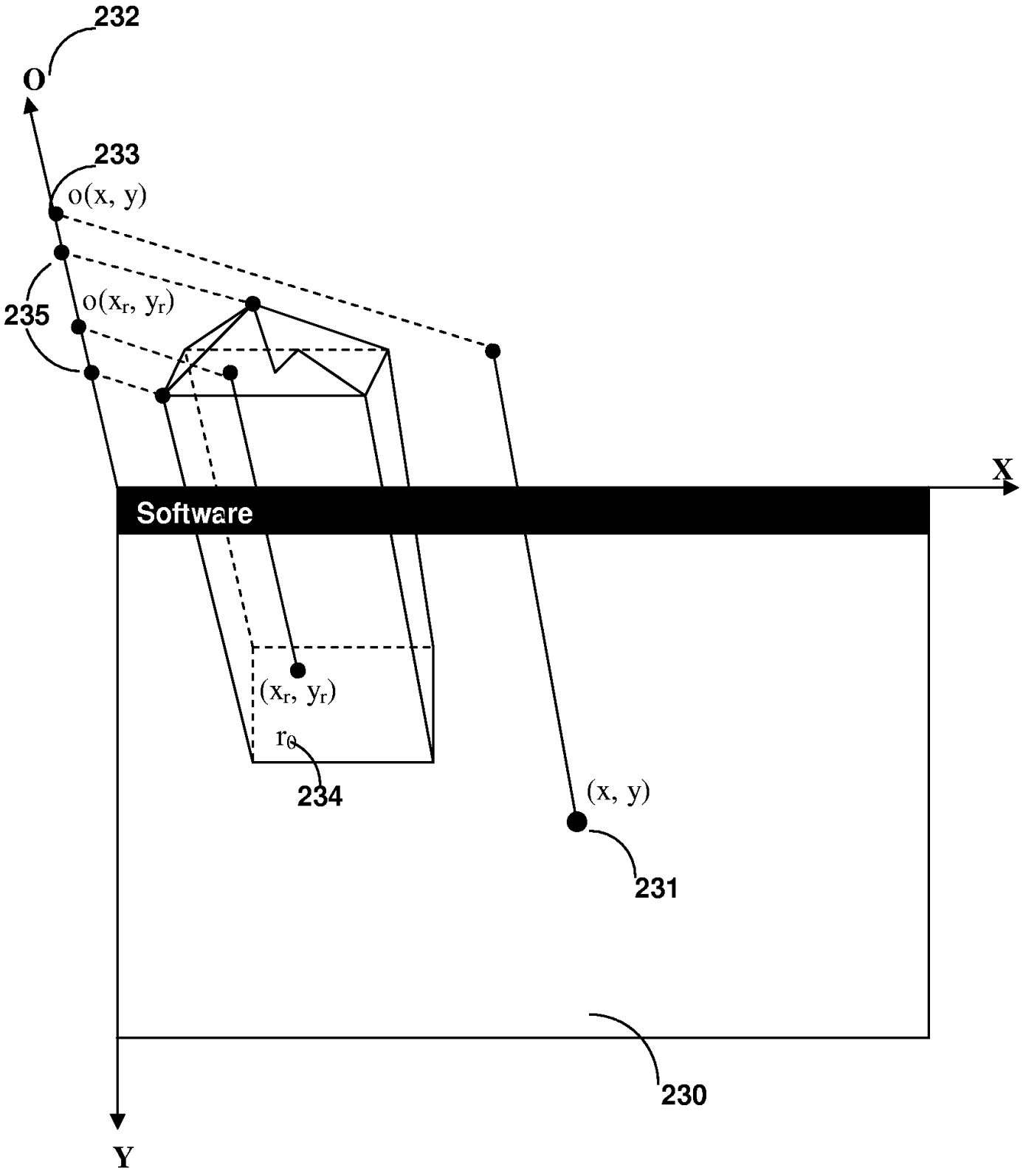


FIG. 2F

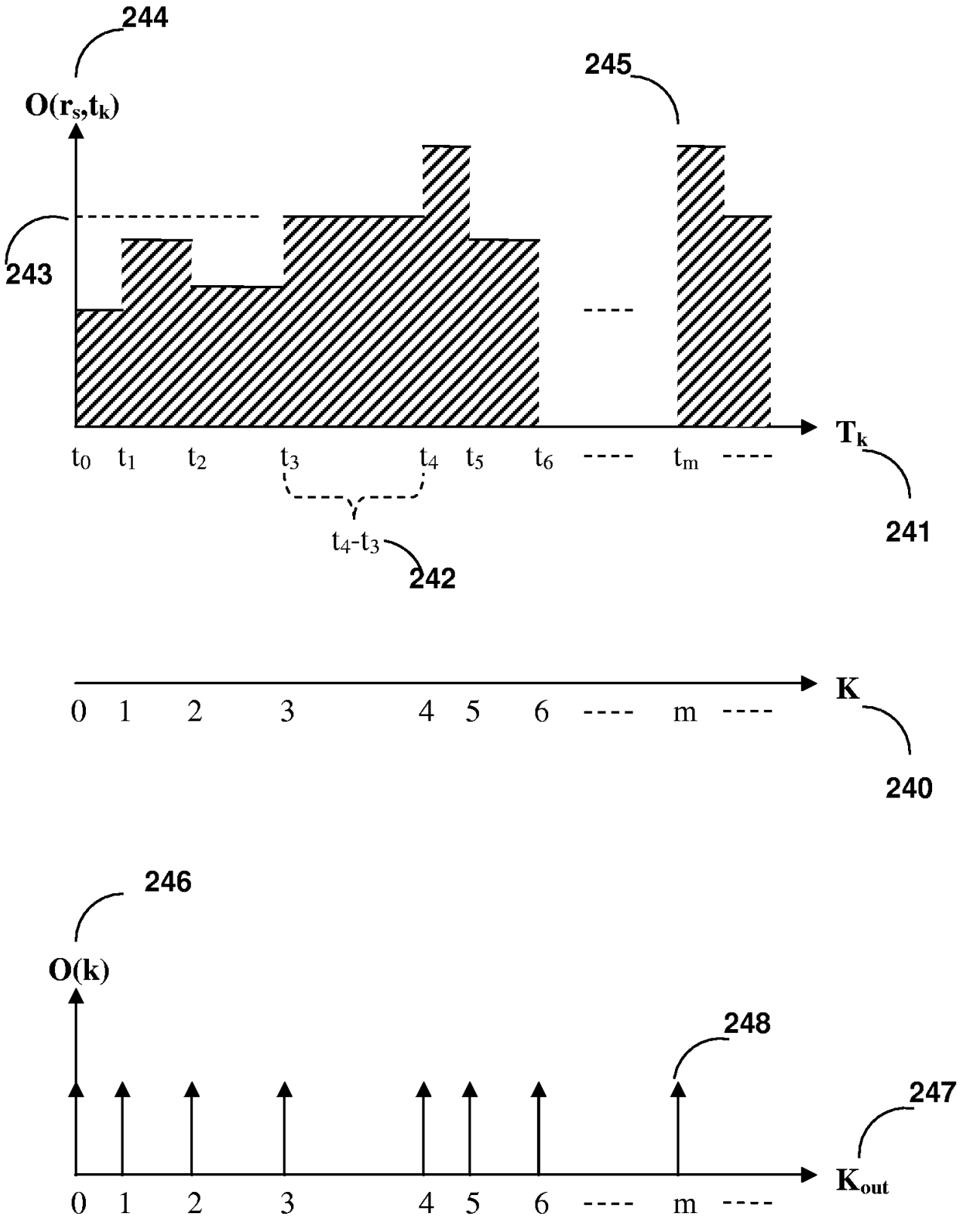
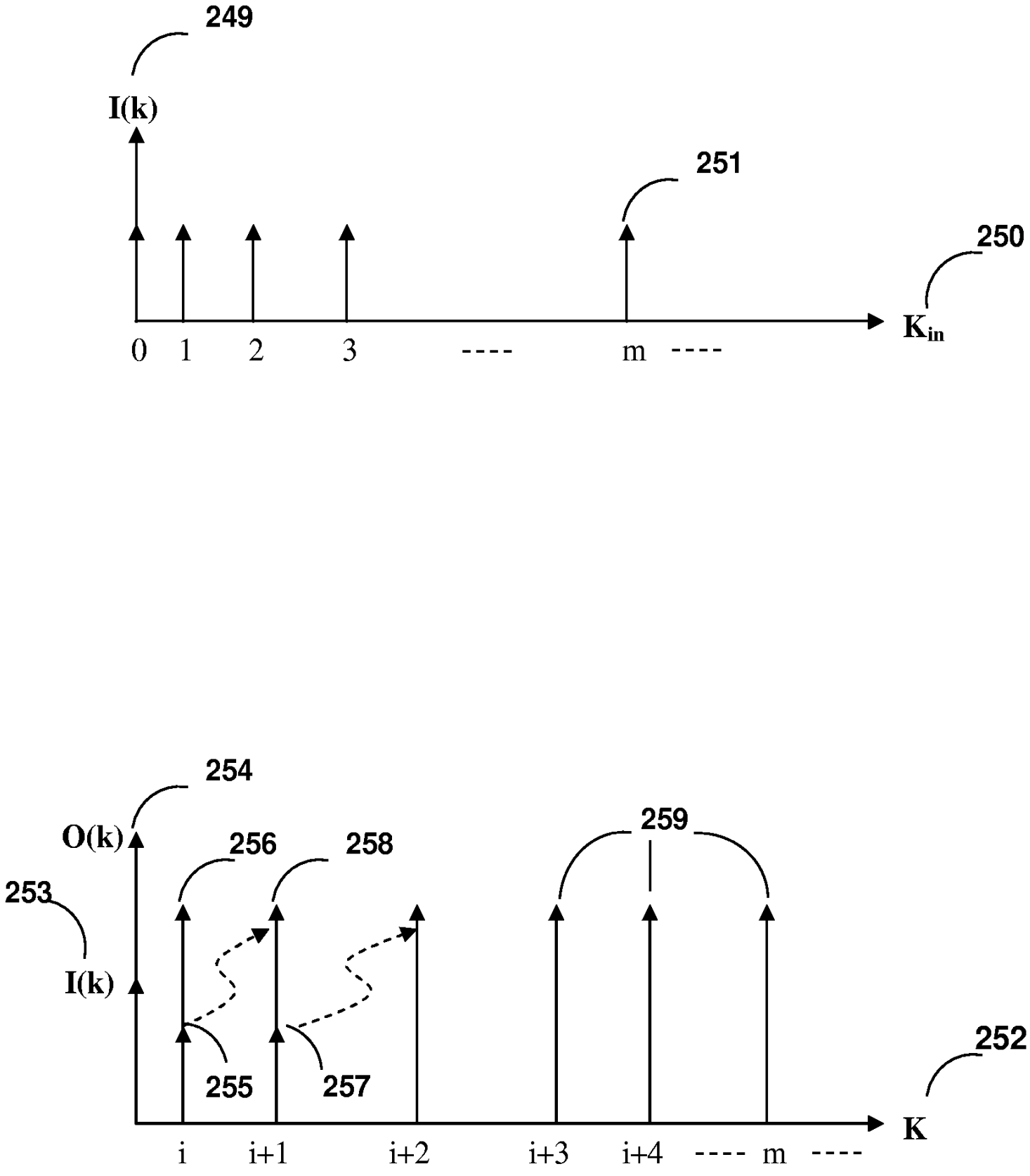

244
O(r_s,t_k)
245
243
T_k
241
t_0 t_1 t_2 t_3 t_4 t_5 t_6 ---- t_m ----
t_4-t_3
242
0 1 2 3 4 5 6 ---- m ----
K
240
246
O(k)
248
247
K_out
0 1 2 3 4 5 6 ---- m ----

FIG. 2G


249
I(k)
251
250
K_{in}
0
1
2
3
----
m

254
O(k)
256
258
259
253
I(k)
255
257
252
K
i
i+1
i+2
i+3
i+4
----
m

FIG. 2H

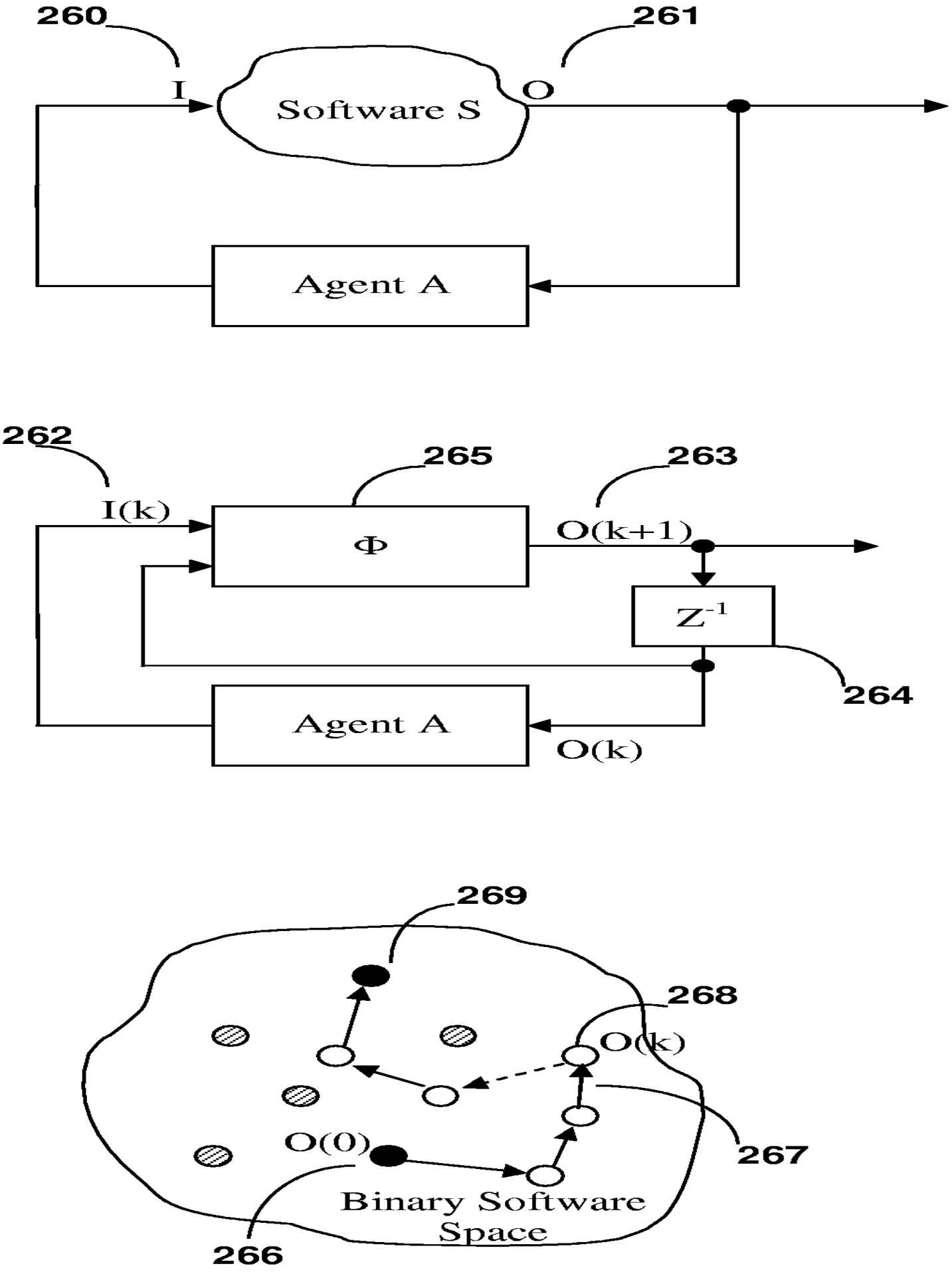
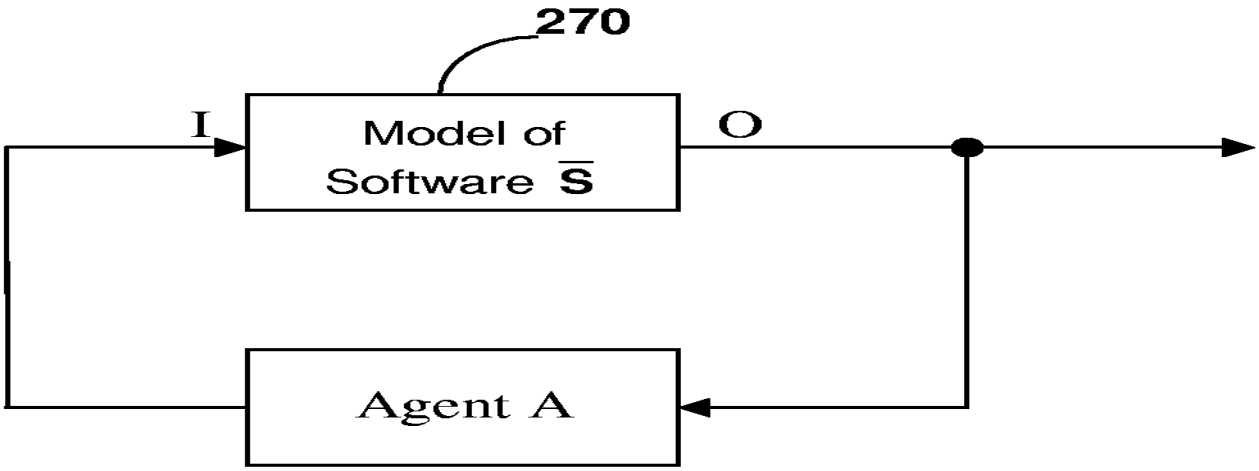
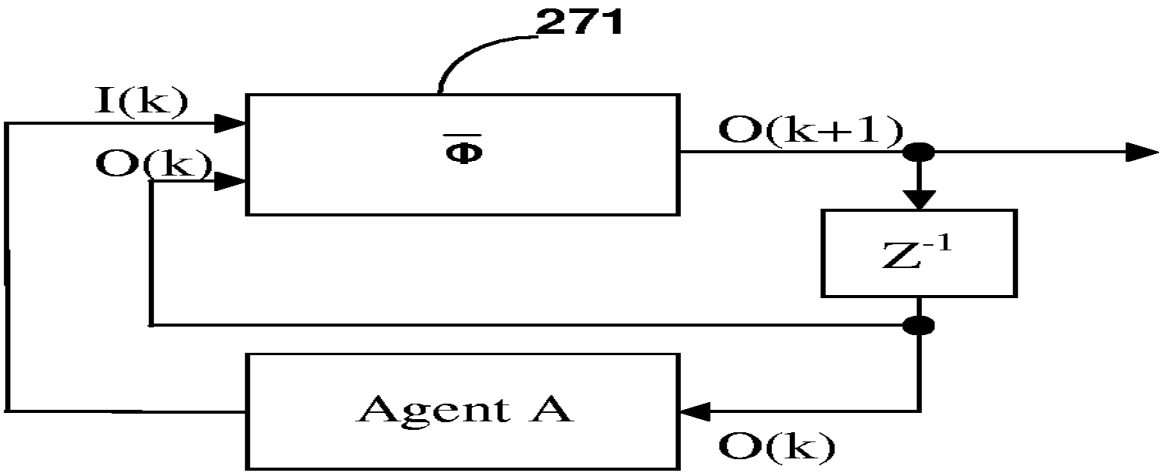

260
261
I
Software S
O
Agent A
262
265
263
I(k)
Φ
O(k+1)
Z-1
264
Agent A
O(k)
269
268
O(k)
O(0)
267
Binary Software
Space
266

FIG. 2I


270
I
Model of
Software $\overline{S}$
O
Agent A


271
I(k)
O(k)
$\overline{\Phi}$
O(k+1)
Z^{-1}
Agent A
O(k)

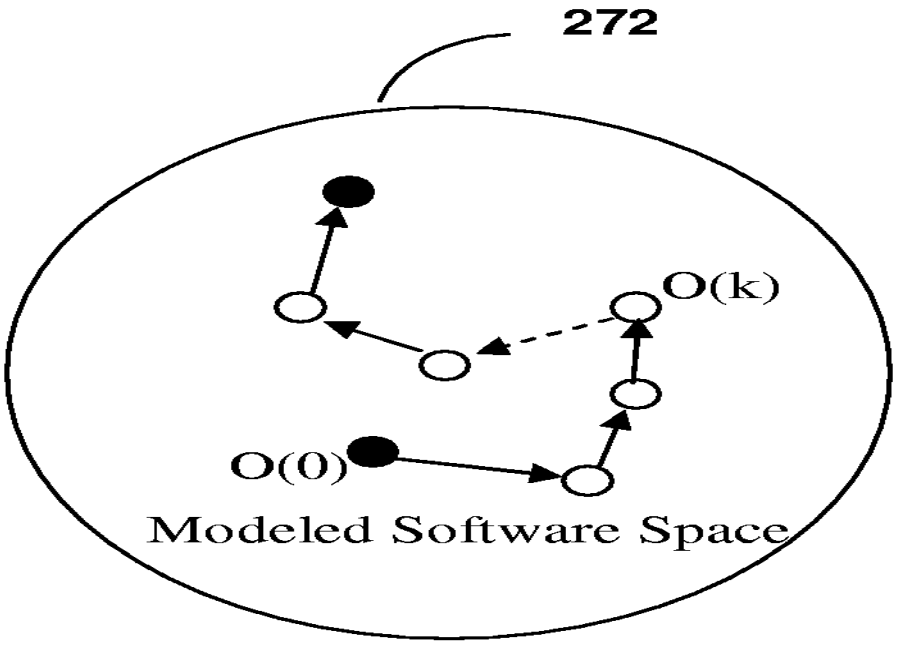
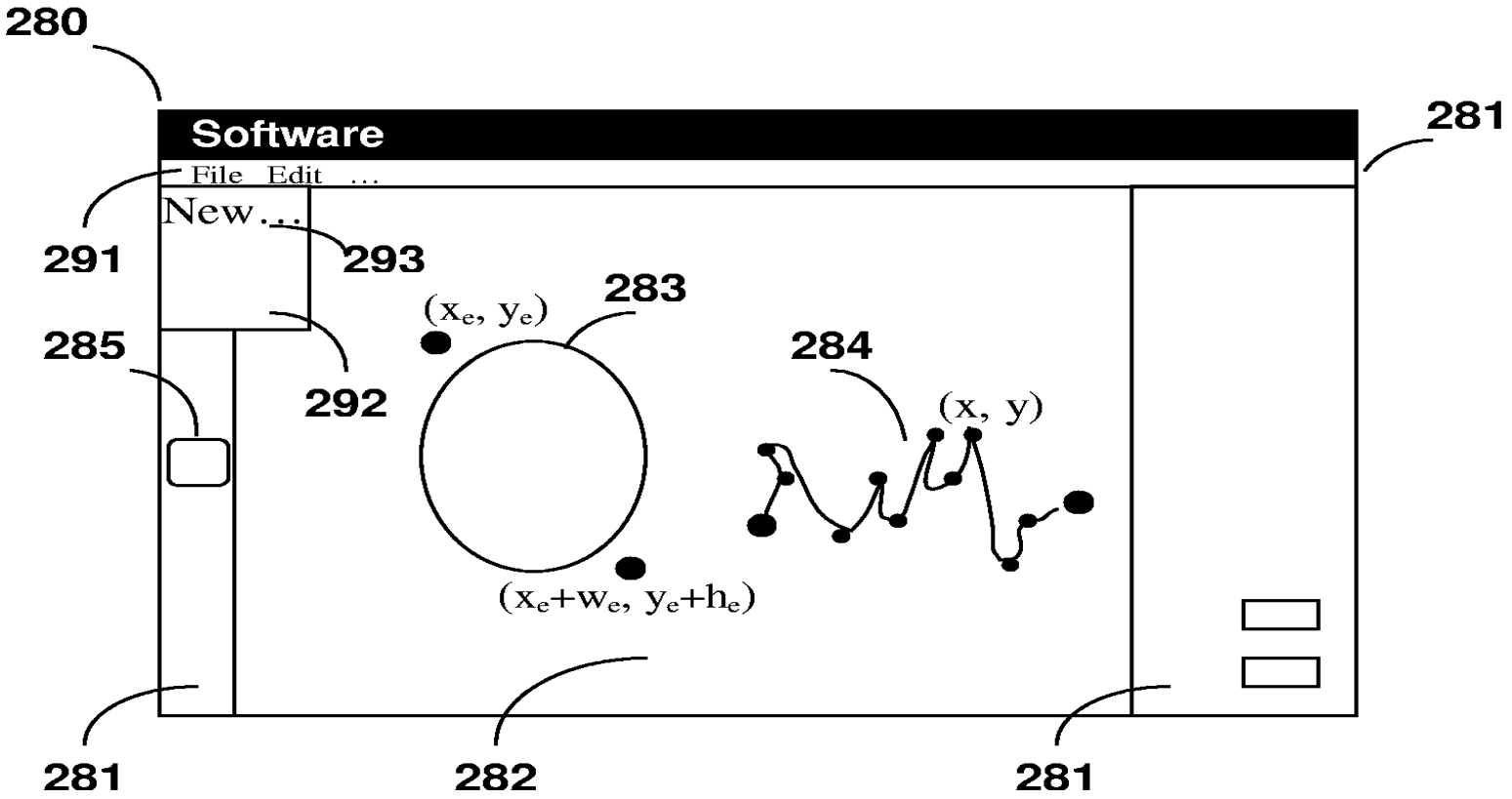

272
O(k)
O(0)
Modeled Software Space

FIG. 2J


280
Software
281
File Edit ...
New...
291
293
283
(x_e, y_e)
285
284
292
(x, y)
(x_e+w_e, y_e+h_e)
281
282
281

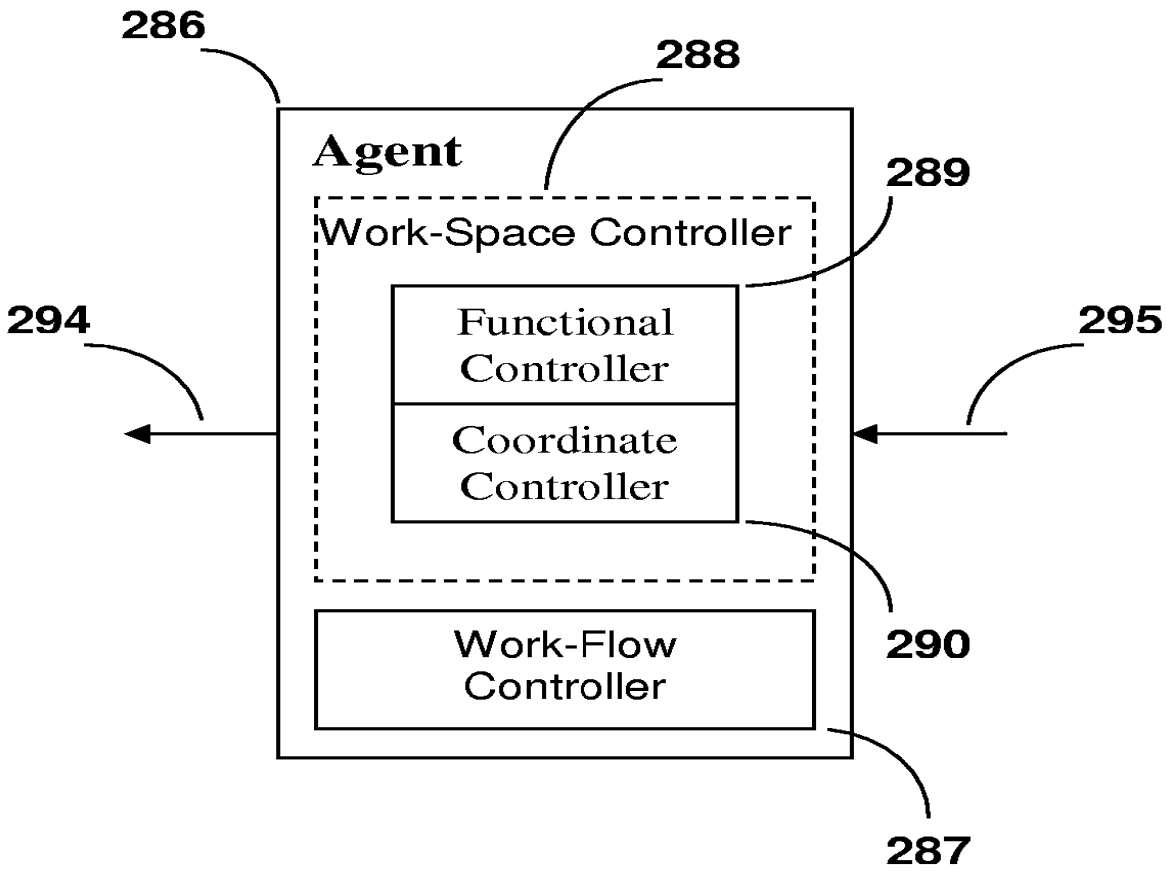
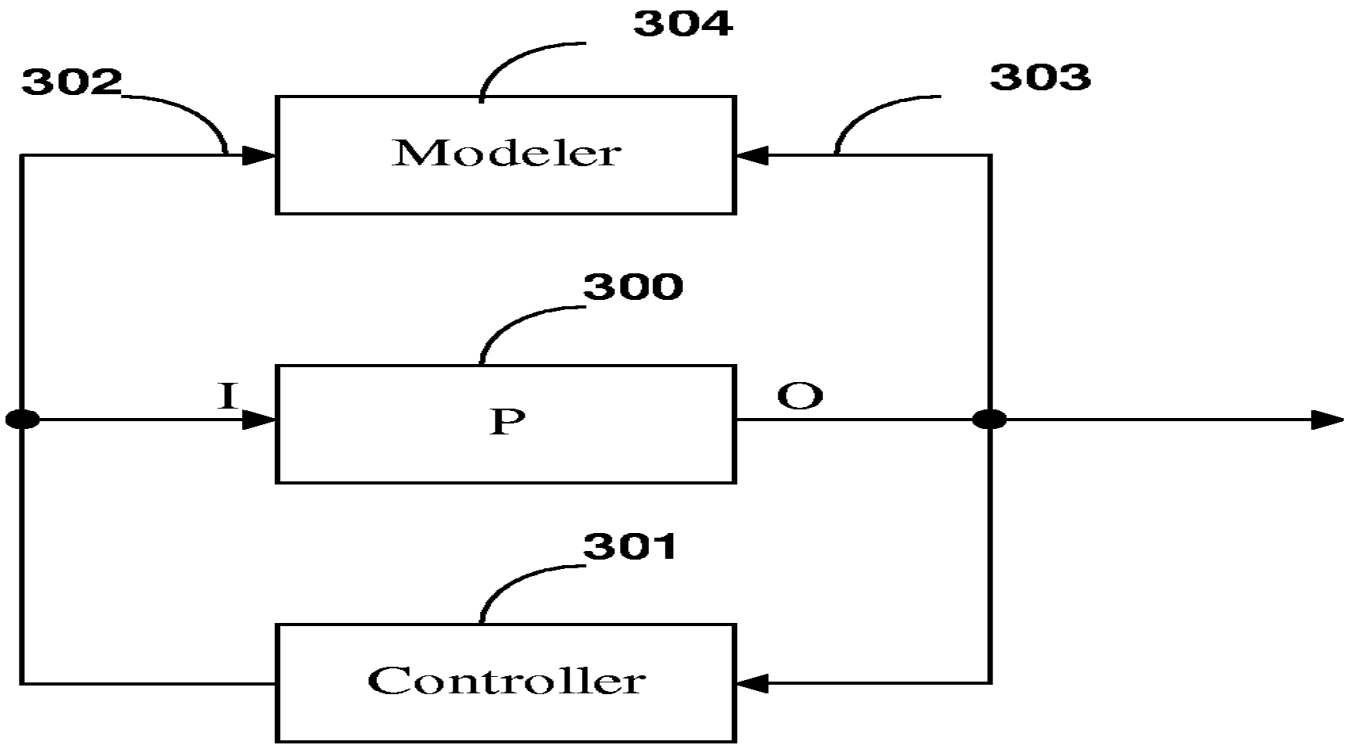

286
288
Agent
289
Work-Space Controller
294
295
Functional Controller
Coordinate Controller
290
Work-Flow Controller
287

FIG. 2K


304
302
303
Modeler
300
I
P
O
301
Controller

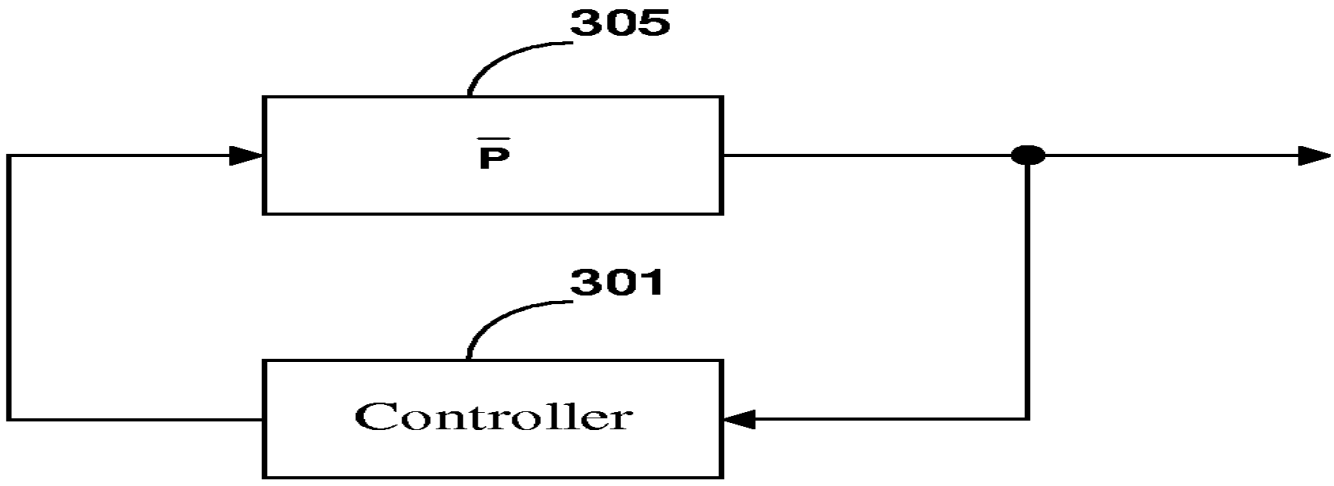
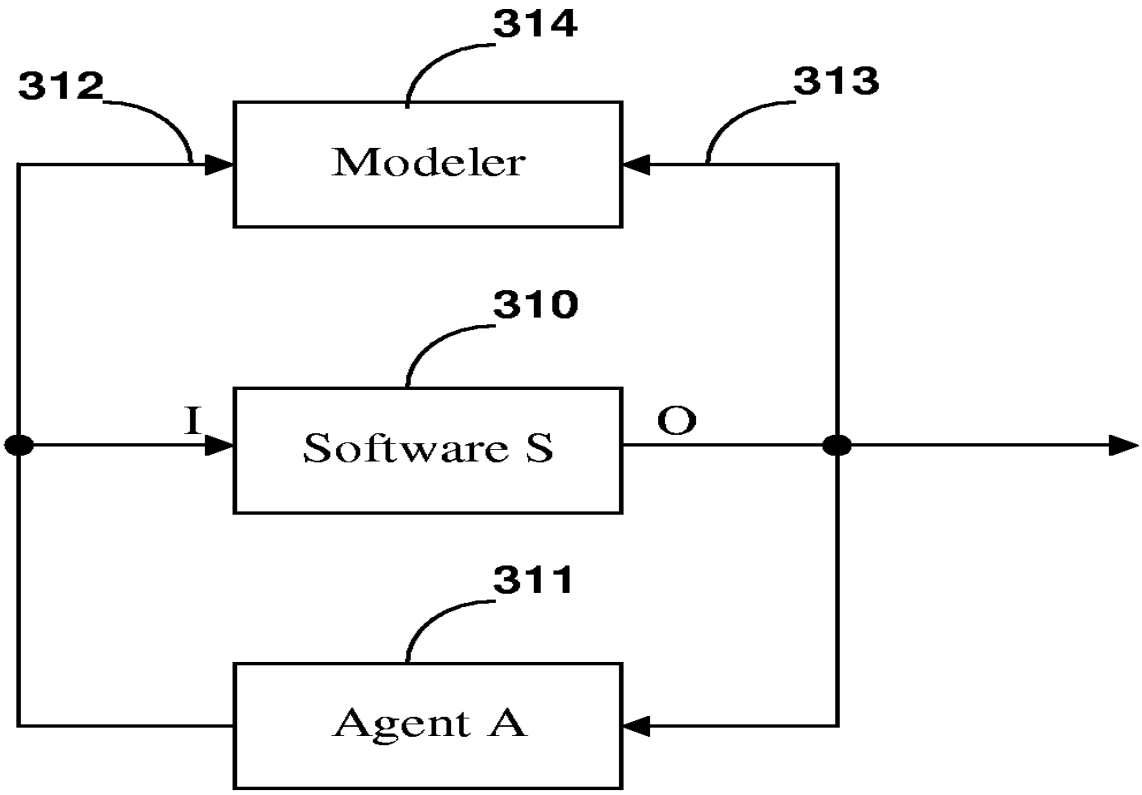

305
$\bar{P}$
301
Controller

FIG. 3A


314
312
313
Modeler
310
I
Software S
O
311
Agent A

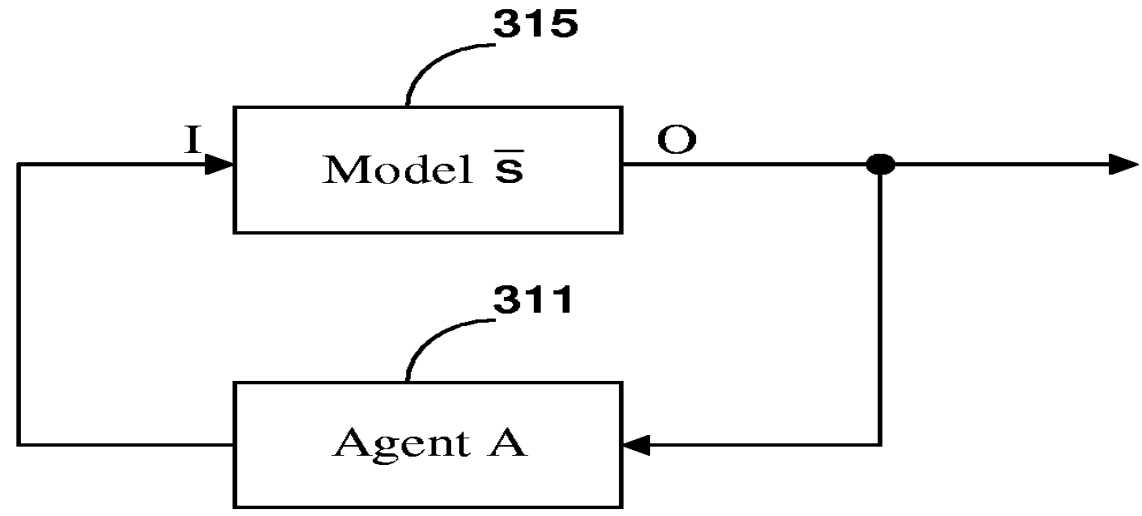
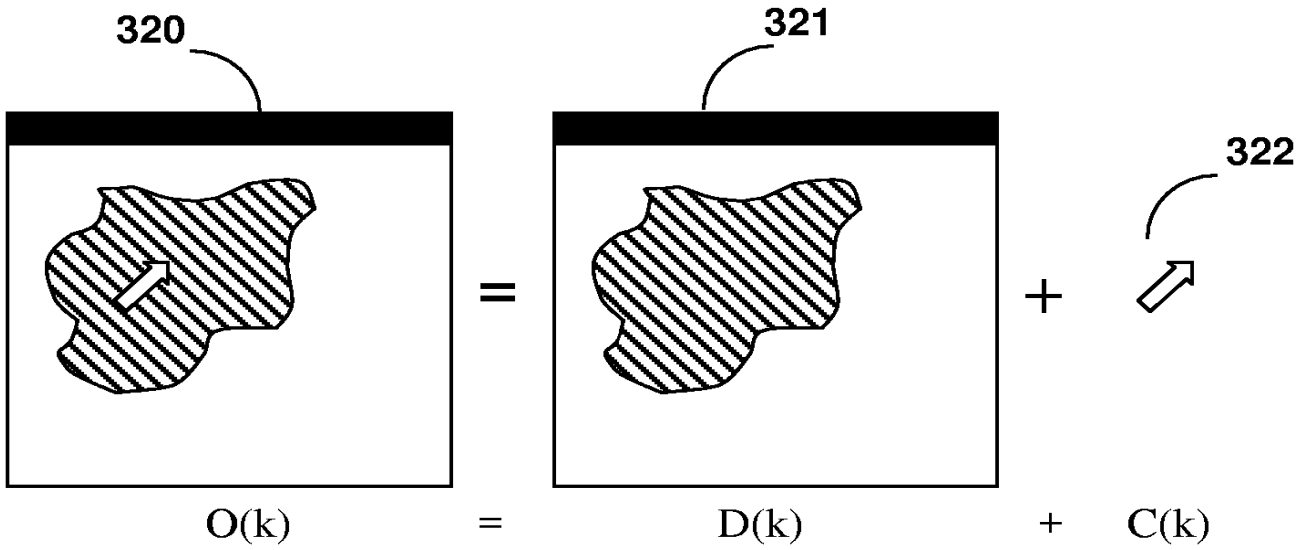

315
I
Model $\bar{s}$
O
311
Agent A

FIG. 3B


320
321
322
=
+
O(k)
=
D(k)
+
C(k)

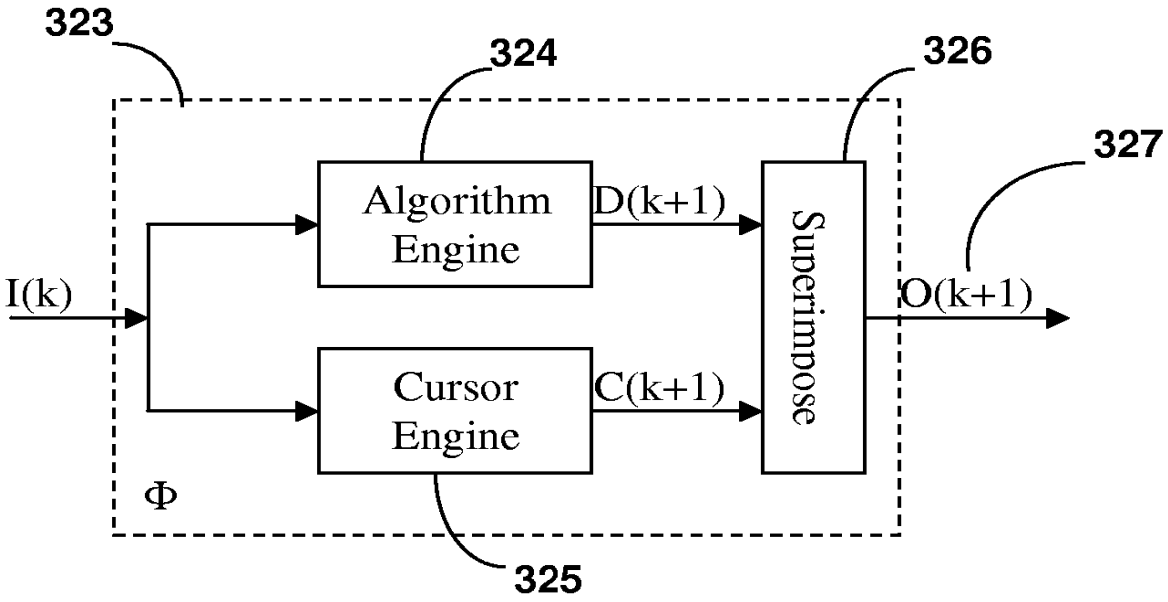
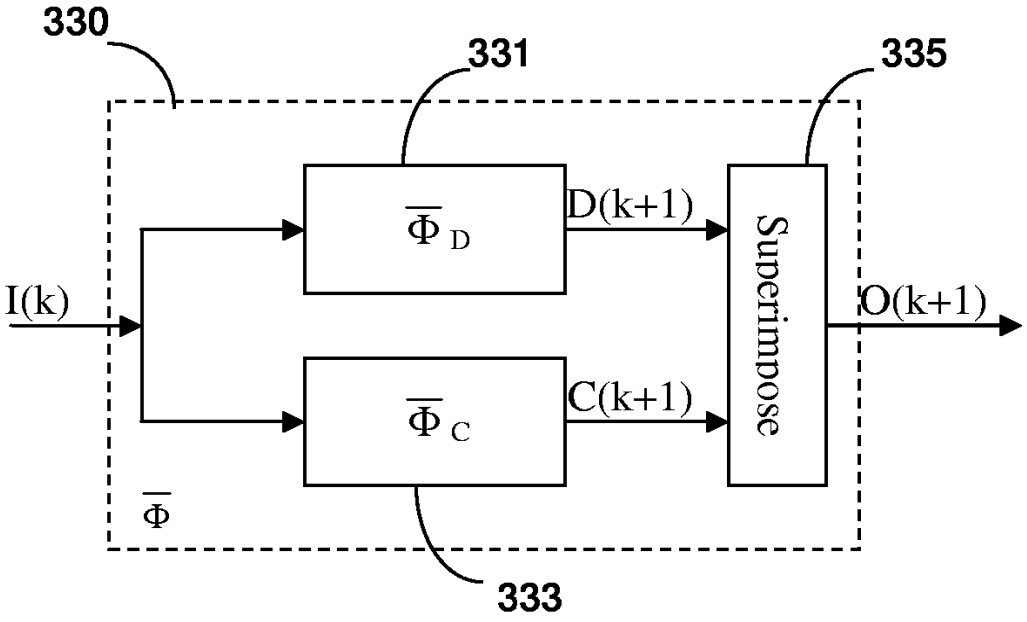

323
324
326
327
Algorithm Engine
D(k+1)
Superimpose
I(k)
O(k+1)
Cursor Engine
C(k+1)
Φ
325

FIG. 3C


330
331
335
$\overline{\Phi}_D$
D(k+1)
Superimpose
I(k)
O(k+1)
$\overline{\Phi}_C$
C(k+1)
$\overline{\Phi}$
333

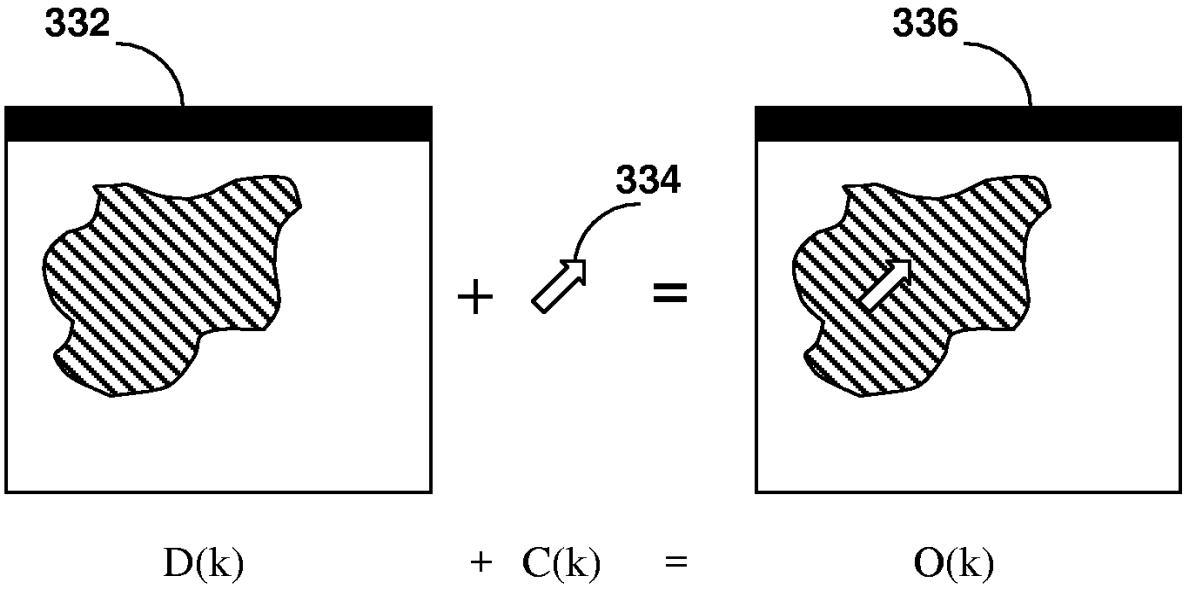
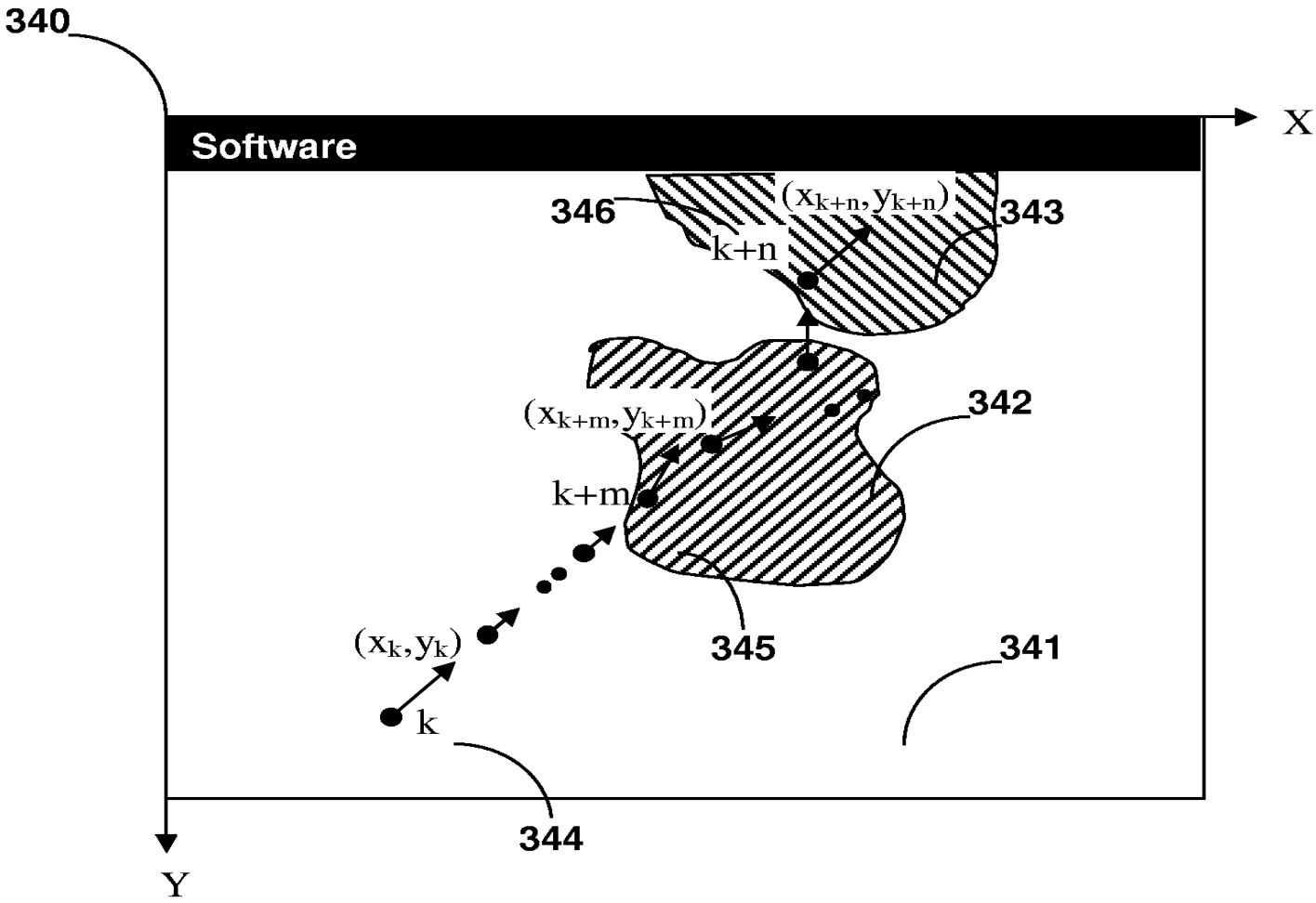

332
336
334
+
=
D(k)
+ C(k)
=
O(k)

FIG. 3D


340
Software
X
346
(x_{k+n}, y_{k+n})
343
k+n
(x_{k+m}, y_{k+m})
342
k+m
(x_k, y_k)
345
341
k
344
Y

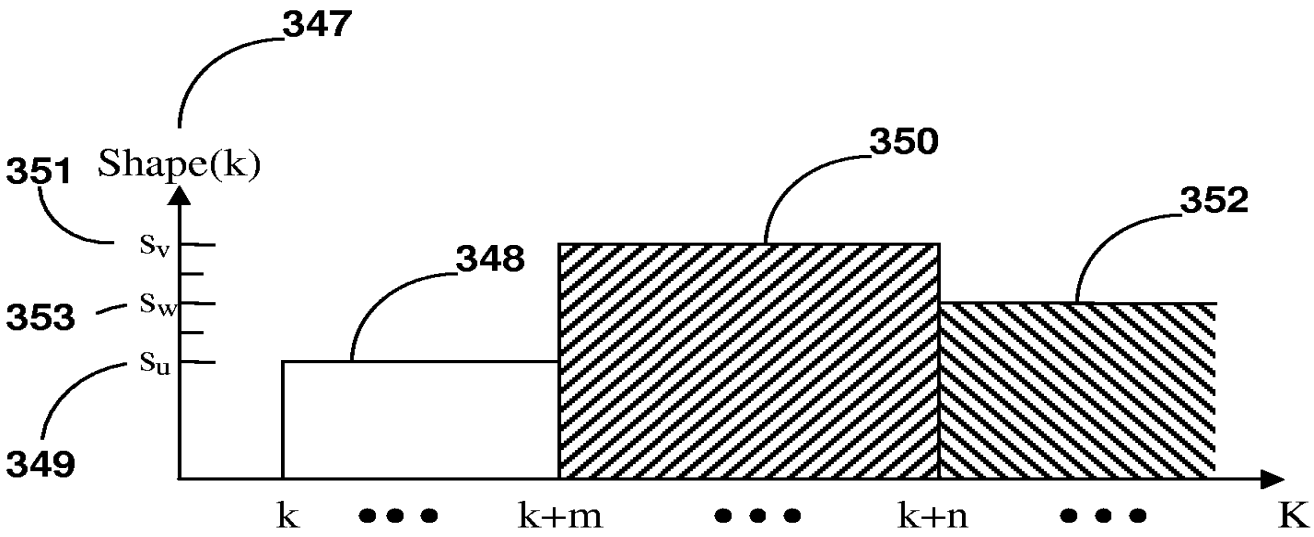

347
351
Shape(k)
350
352
348
353
S_v
S_w
S_u
349
k
k+m
k+n
K

FIG. 3E

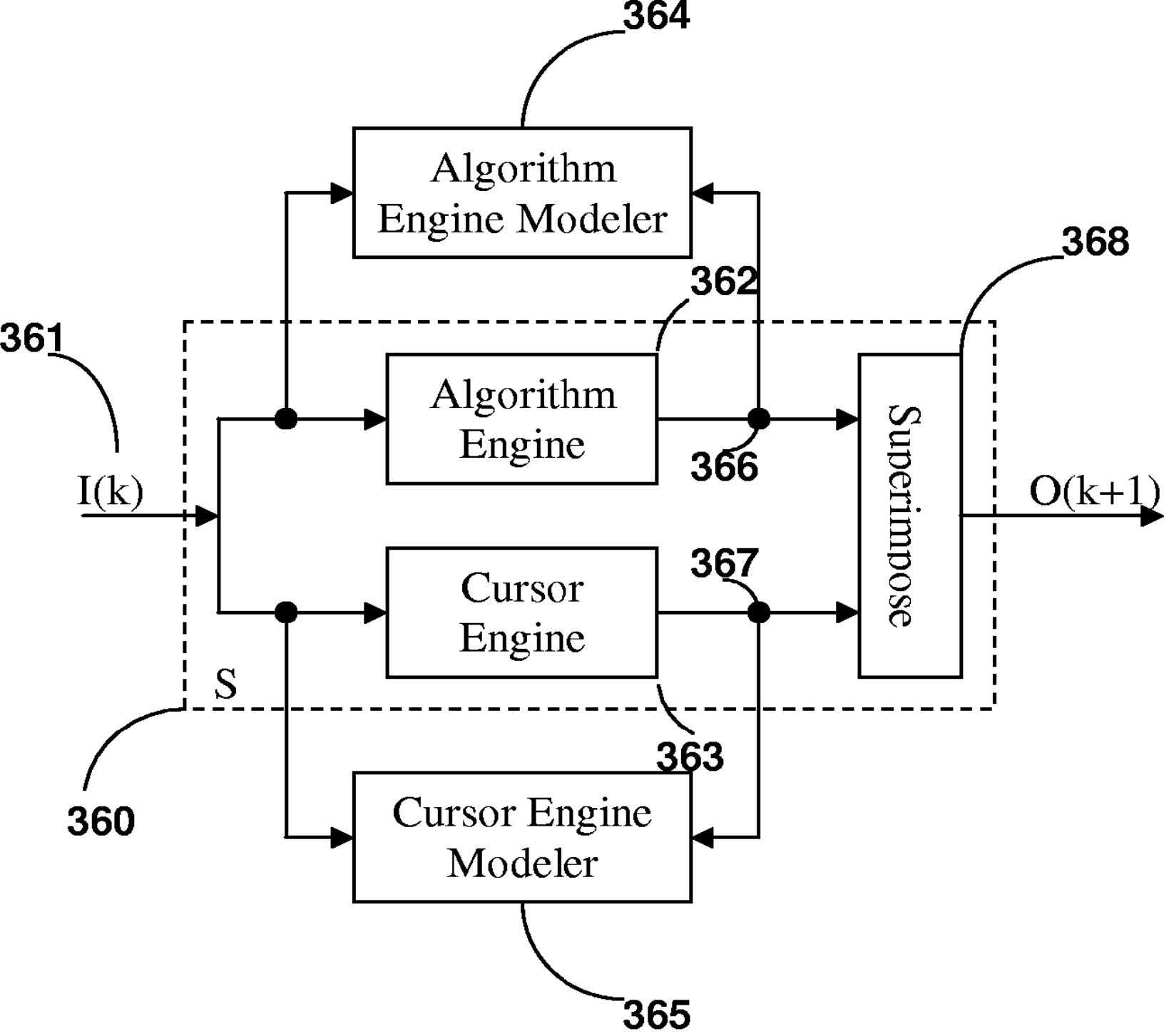

364
Algorithm Engine Modeler
368
362
361
Algorithm Engine
Superimpose
I(k)
366
O(k+1)
367
Cursor Engine
S
363
360
Cursor Engine Modeler
365

FIG. 3F

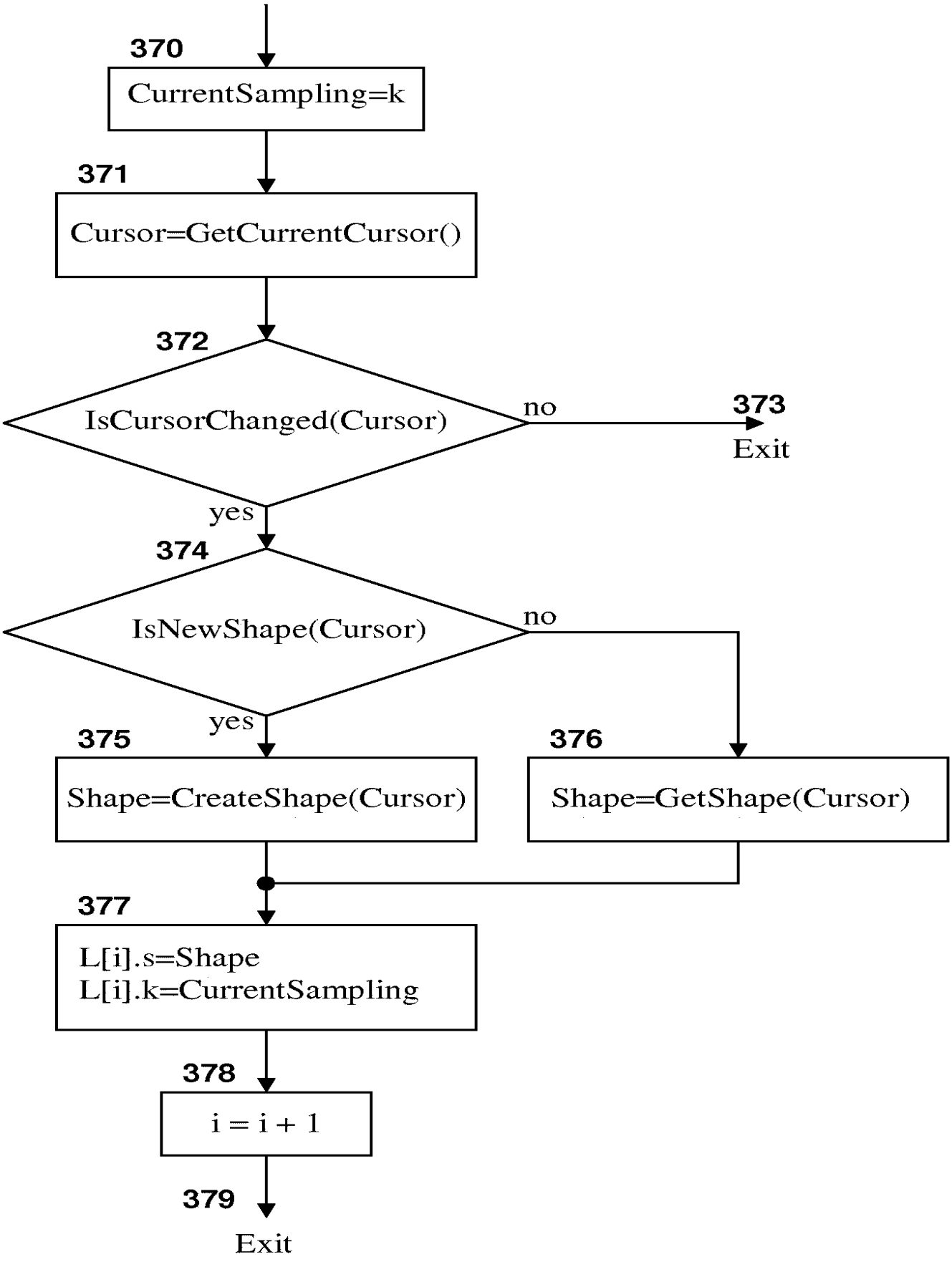

370
CurrentSampling=k
371
Cursor=GetCurrentCursor()
372
IsCursorChanged(Cursor)
no
373
Exit
yes
374
IsNewShape(Cursor)
no
yes
375
Shape=CreateShape(Cursor)
376
Shape=GetShape(Cursor)
377
L[i].s=Shape
L[i].k=CurrentSampling
378
i = i + 1
379
Exit

FIG. 3G

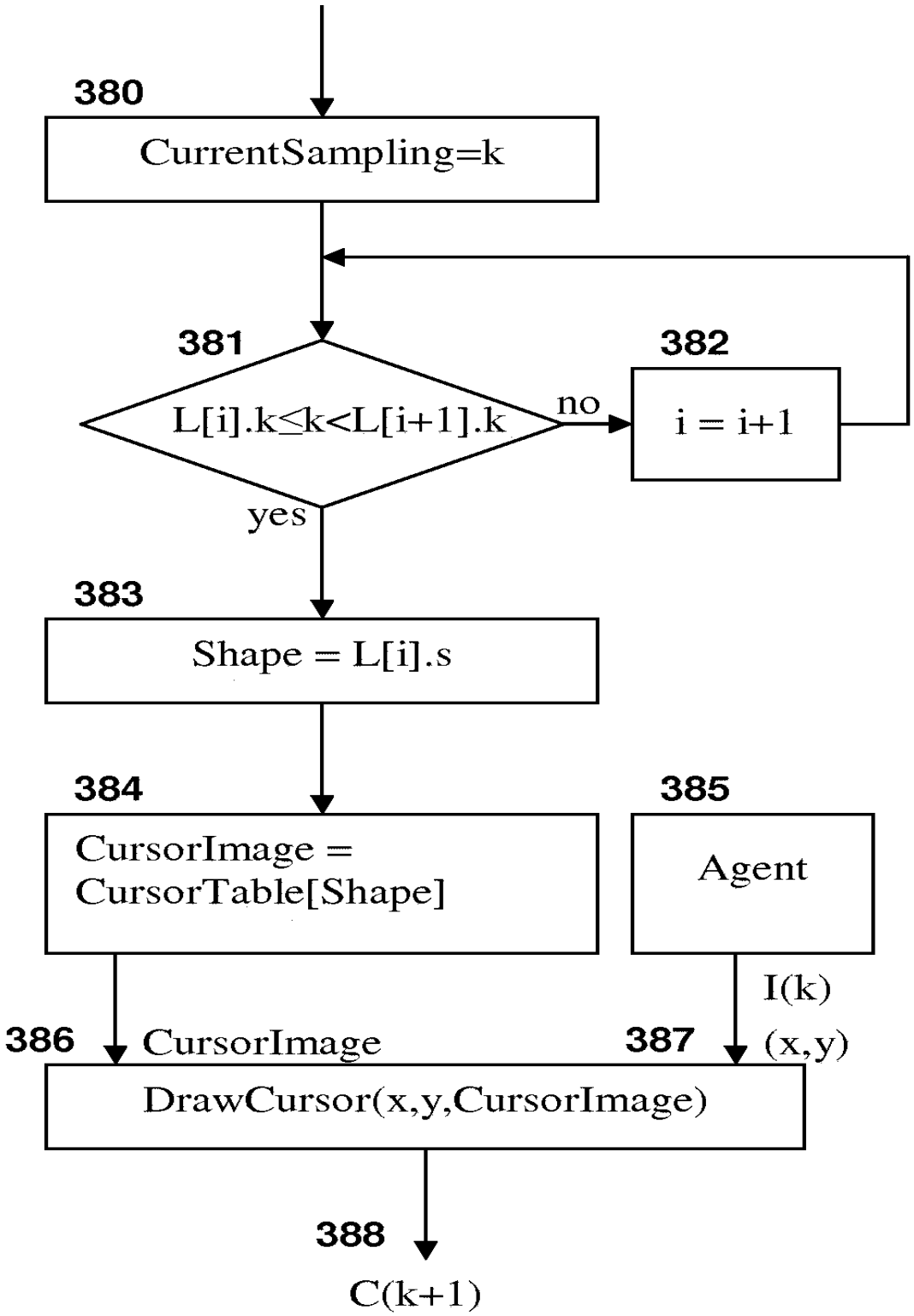

380
CurrentSampling=k
381
L[i].k≤k<L[i+1].k
no
382
i = i+1
yes
383
Shape = L[i].s
384
CursorImage =
CursorTable[Shape]
385
Agent
I(k)
386
CursorImage
387
(x,y)
DrawCursor(x,y,CursorImage)
388
C(k+1)

FIG. 3H

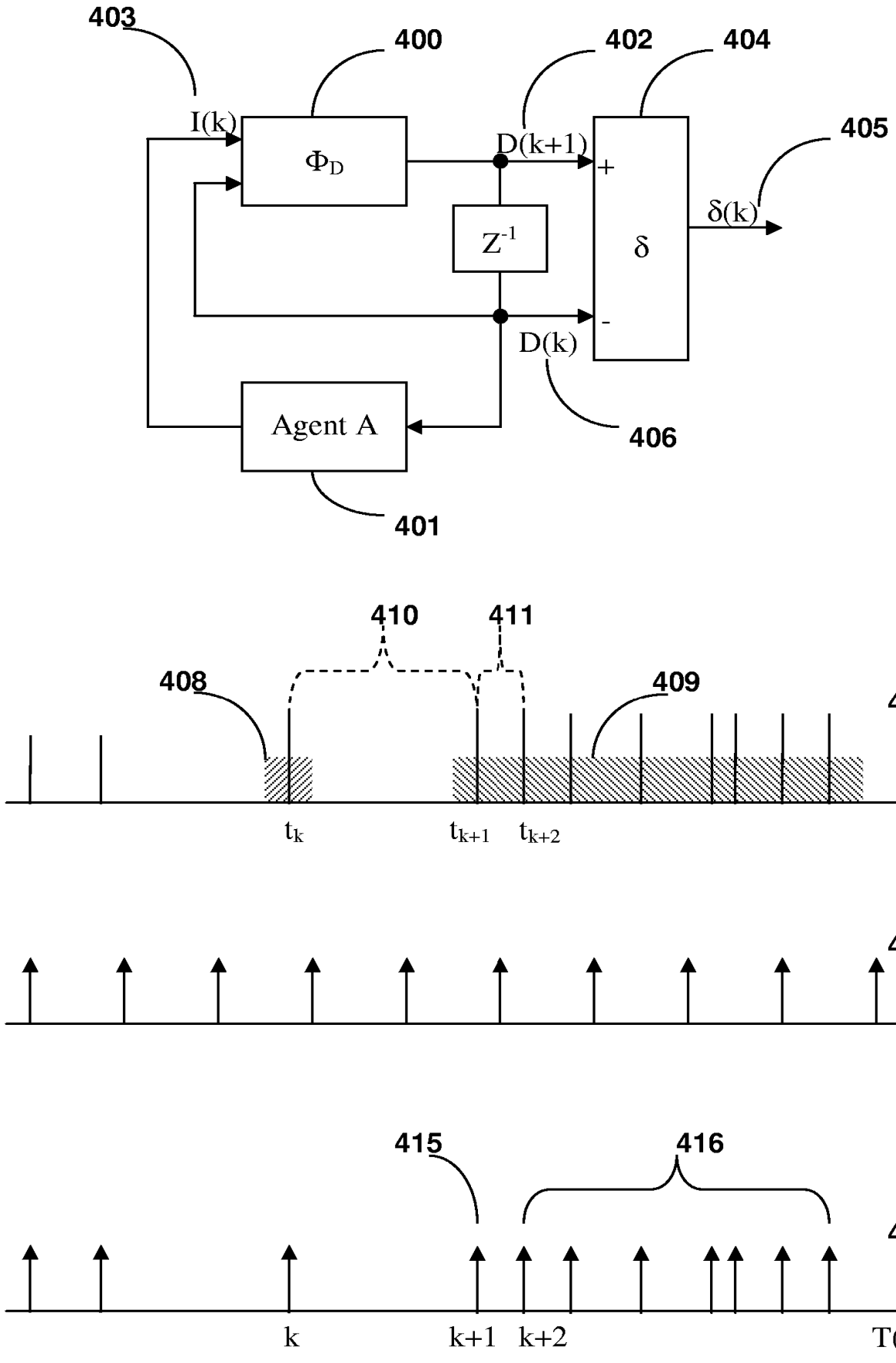

403
400
402
404
405
I(k)
Φ_D
D(k+1)
+
δ(k)
Z^{-1}
δ
-
D(k)
406
Agent A
401
410
411
408
409
407
t_k
t_{k+1}
t_{k+2}
T
413
T(K)
415
416
414
k
k+1
k+2
$T(K_{dynamic})$

FIG. 4A

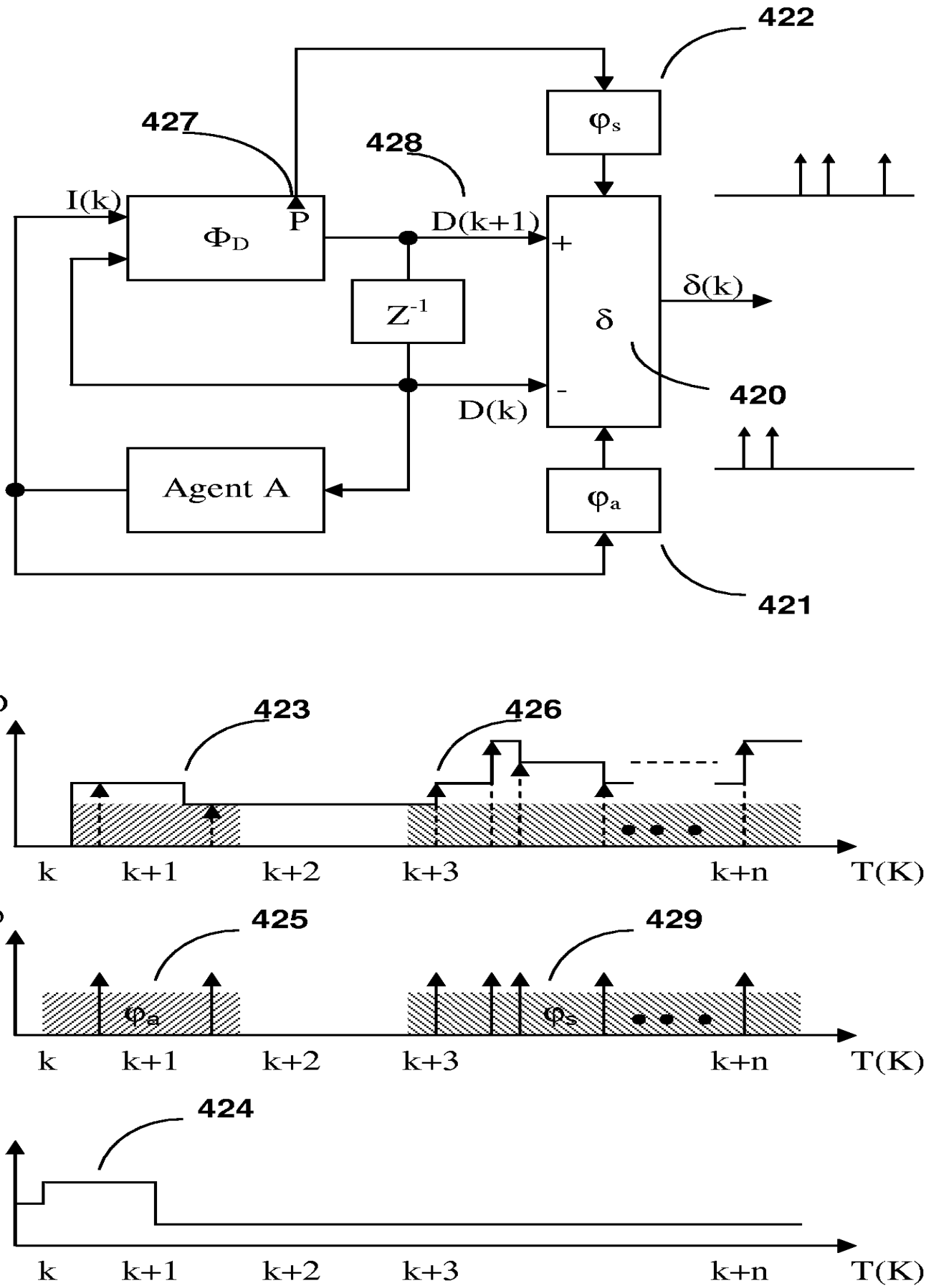

422
427
428
I(k)
P
D(k+1)
φ_s
Φ_D
+
$\delta(k)$
Z^{-1}
δ
-
420
D(k)
Agent A
φ_a
421
D
423
426
k
k+1
k+2
k+3
k+n
T(K)
φ
425
429
φ_a
φ_s
k
k+1
k+2
k+3
k+n
T(K)
I
424
k
k+1
k+2
k+3
k+n
T(K)

FIG. 4B

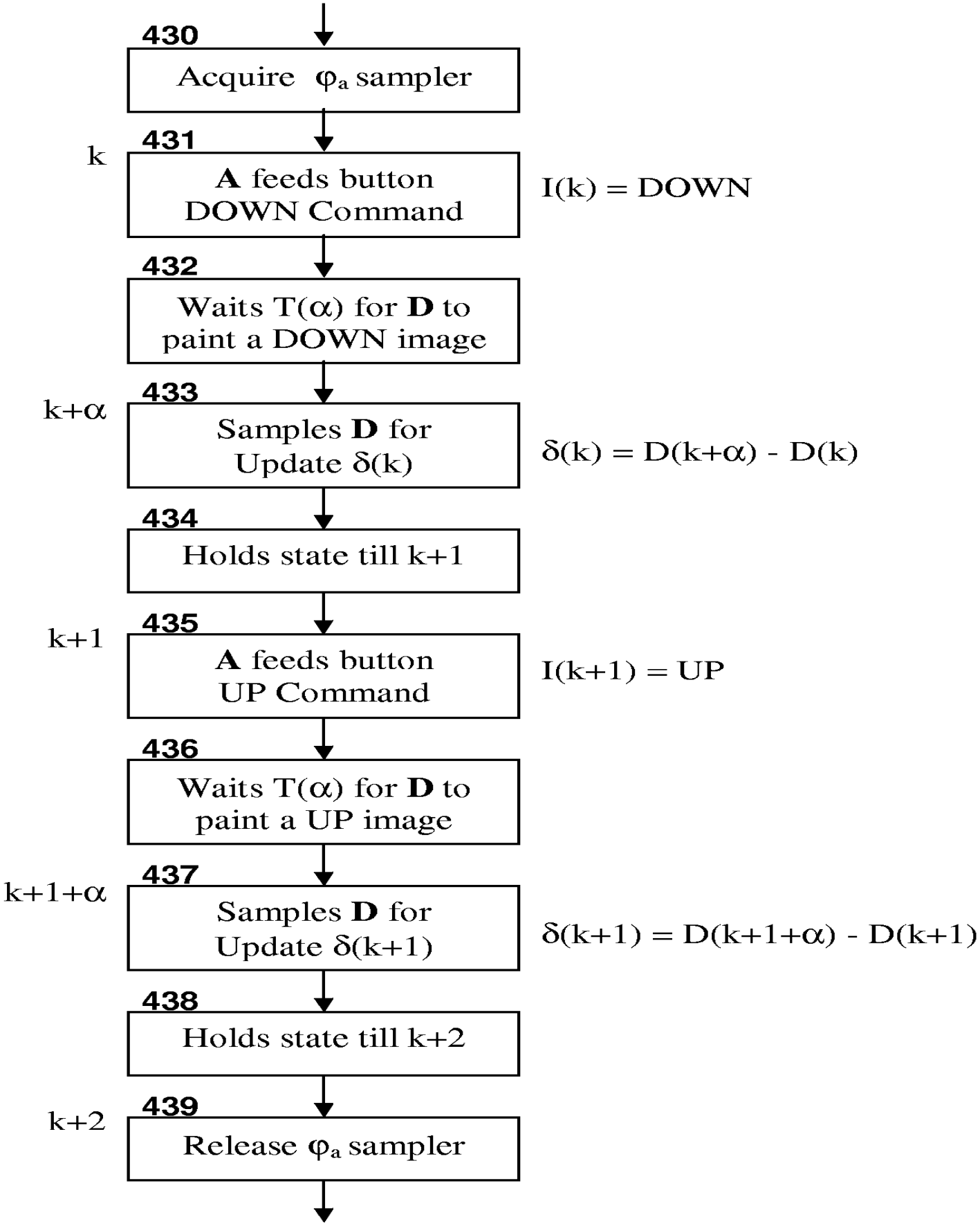

430
Acquire φ_a sampler
k
431
A feeds button DOWN Command
I(k) = DOWN
432
Waits T(α) for D to paint a DOWN image
k+α
433
Samples D for Update δ(k)
δ(k) = D(k+α) - D(k)
434
Holds state till k+1
k+1
435
A feeds button UP Command
I(k+1) = UP
436
Waits T(α) for D to paint a UP image
k+1+α
437
Samples D for Update δ(k+1)
δ(k+1) = D(k+1+α) - D(k+1)
438
Holds state till k+2
k+2
439
Release φ_a sampler

FIG. 4C

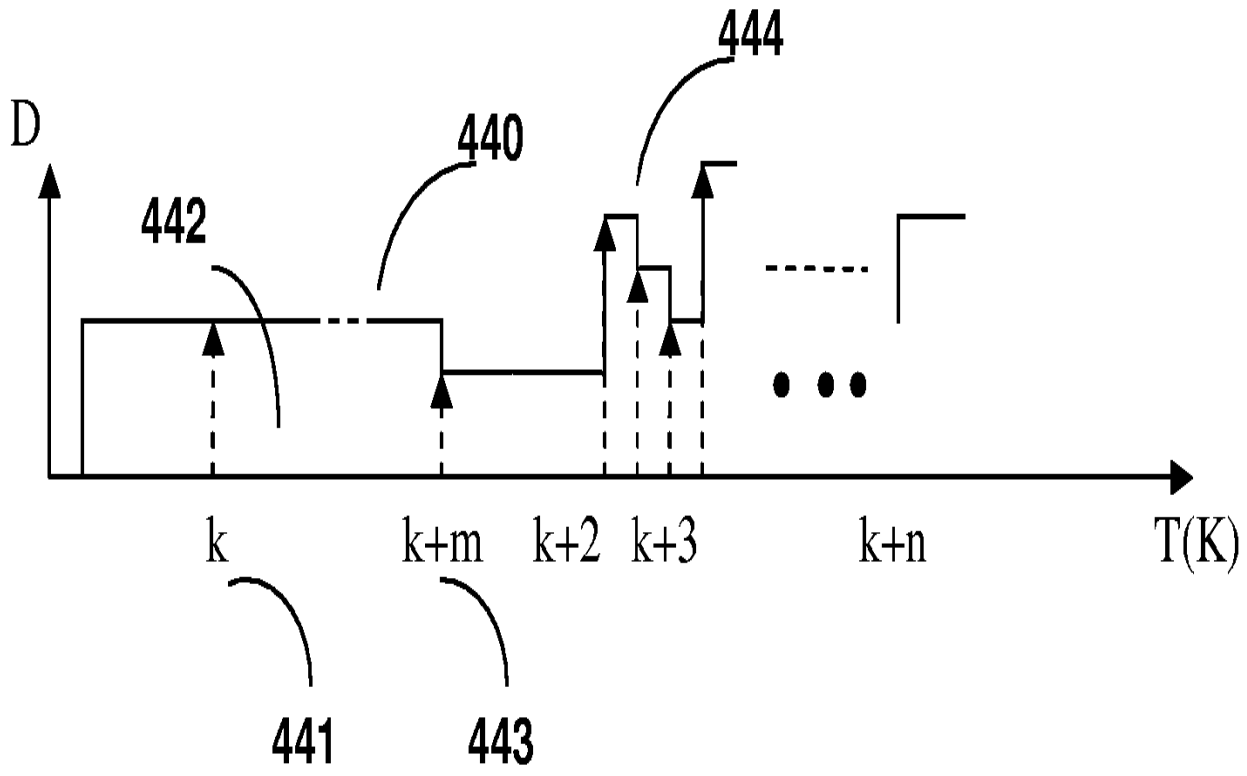


FIG. 4D

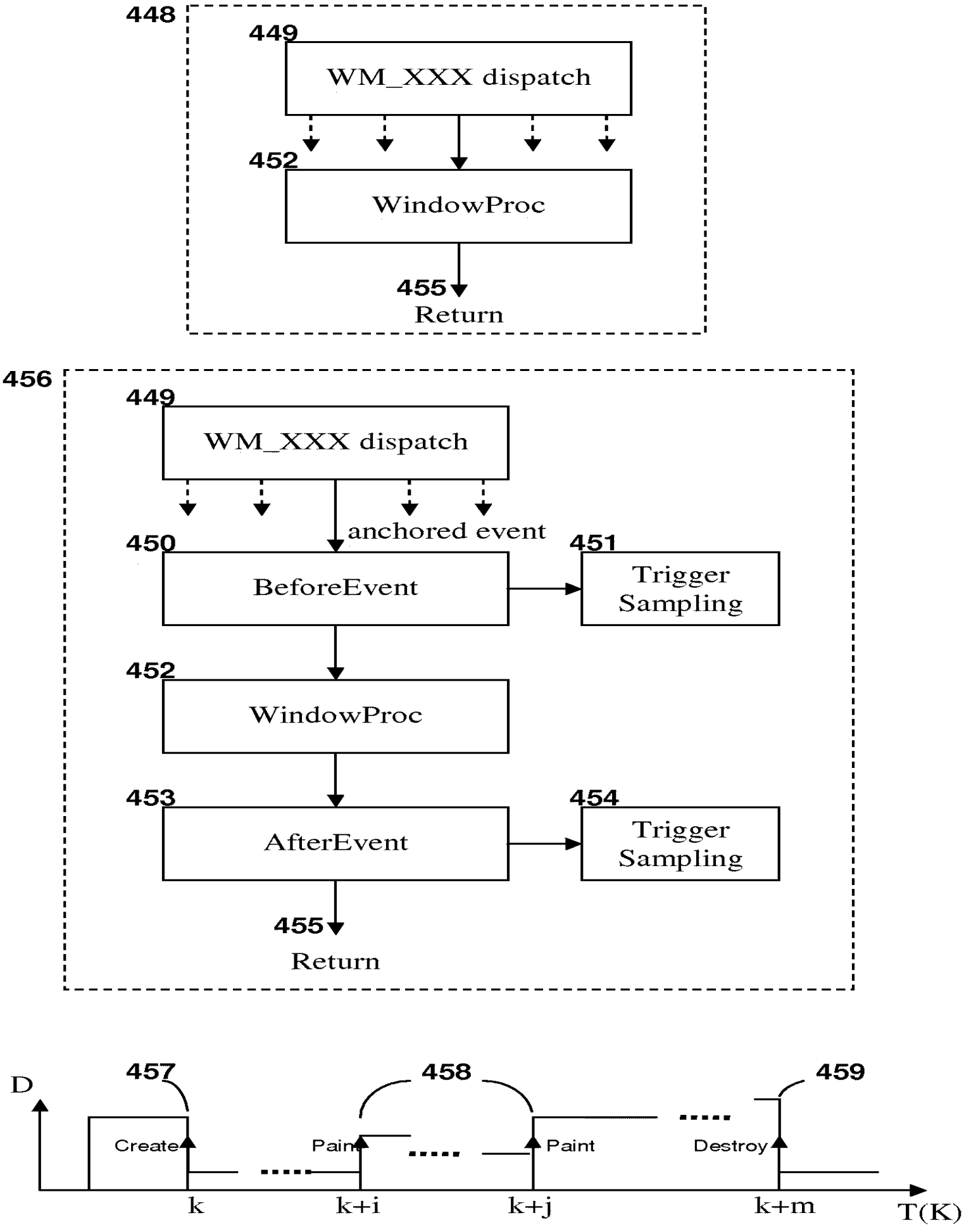

448
449
WM_XXX dispatch
452
WindowProc
455
Return
456
449
WM_XXX dispatch
anchored event
450
BeforeEvent
451
Trigger Sampling
452
WindowProc
453
AfterEvent
454
Trigger Sampling
455
Return
D
457
458
459
Create
Paint
Paint
Destroy
k
k+i
k+j
k+m
T(K)

FIG. 4E

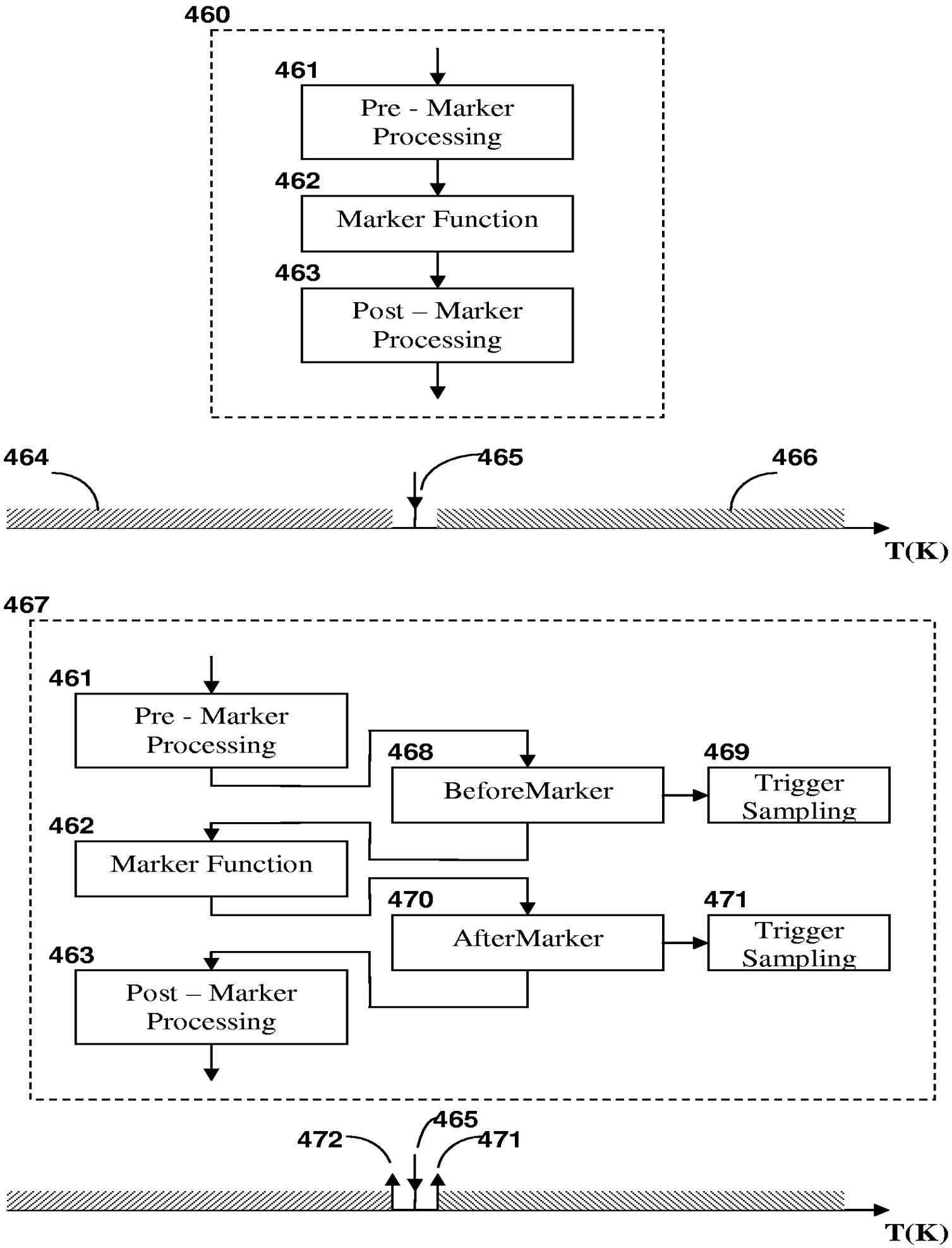
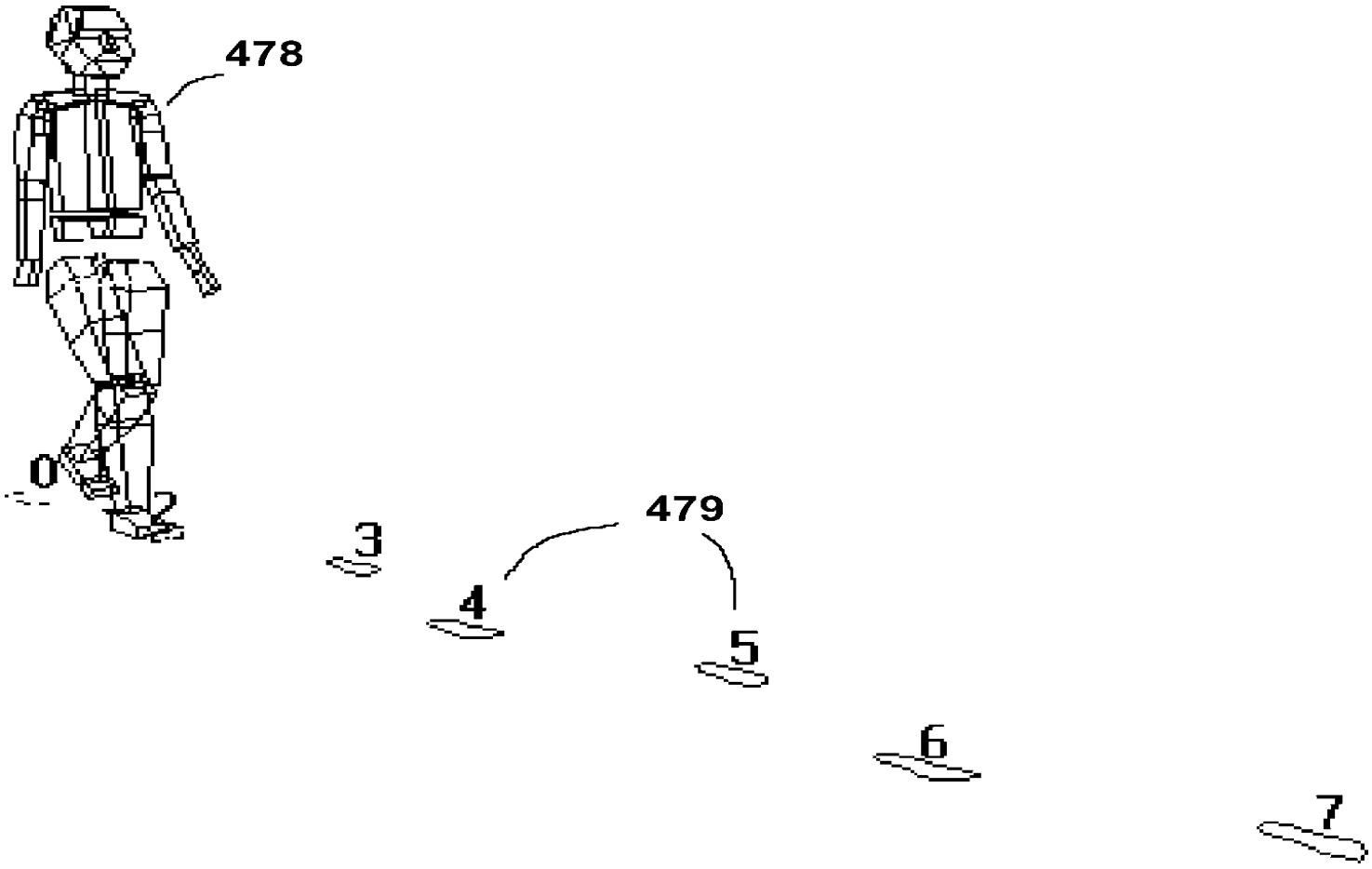

460
461
Pre - Marker Processing
462
Marker Function
463
Post – Marker Processing
464
465
466
T(K)
467
461
Pre - Marker Processing
468
BeforeMarker
469
Trigger Sampling
462
Marker Function
470
AfterMarker
471
Trigger Sampling
463
Post – Marker Processing
472
465
471
T(K)

FIG. 4F


478
0
2
3
479
4
5
6
7

480

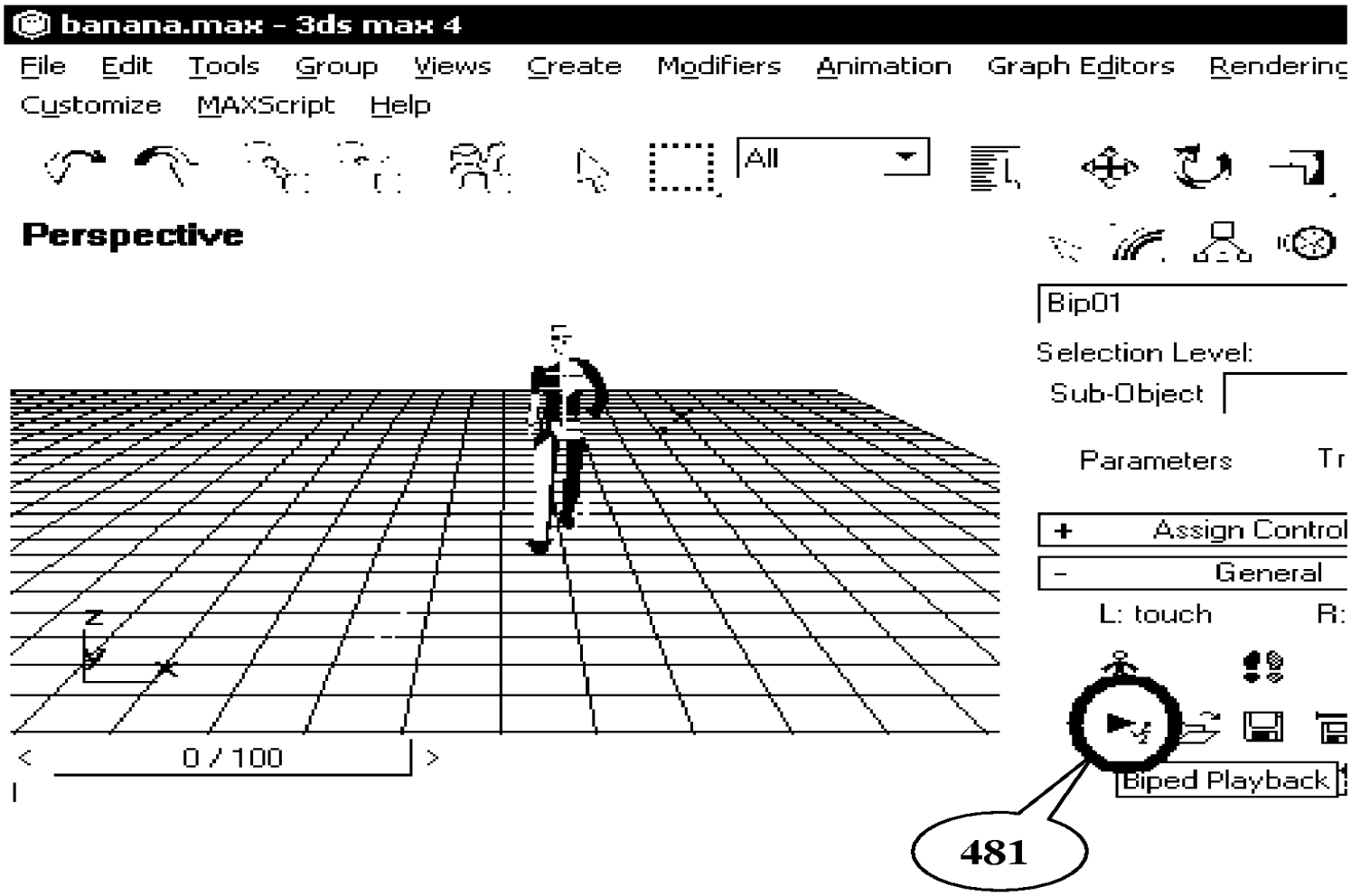

banana.max - 3ds max 4
File Edit Tools Group Views Create Modifiers Animation Graph Editors Rendering
Customize MAXScript Help
All
Perspective
Bip01
Selection Level:
Sub-Object
Parameters
Assign Control
General
L: touch
R:
0 / 100
Biped Playback
481

FIG. 4G

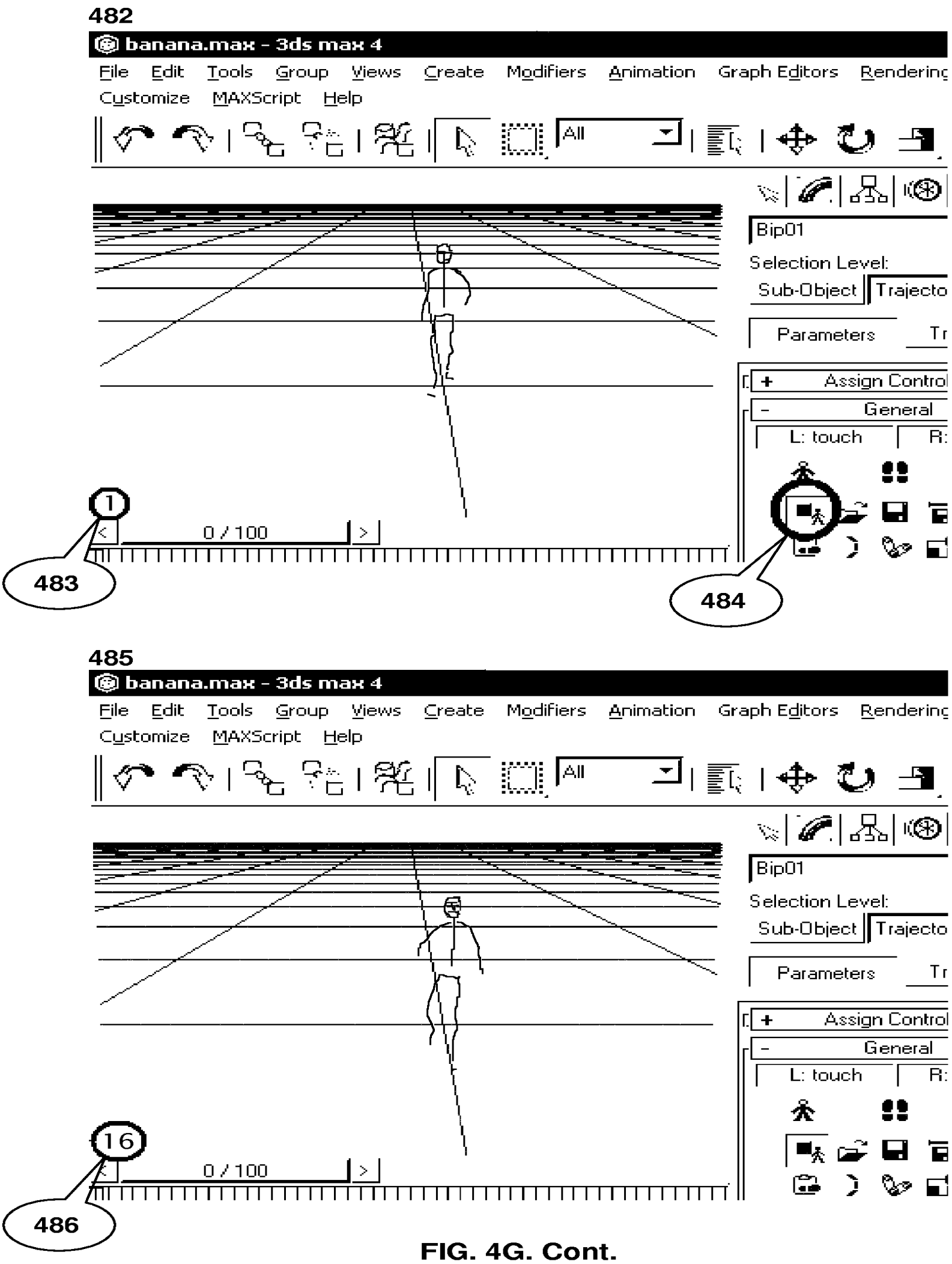

482
banana.max - 3ds max 4
File Edit Tools Group Views Create Modifiers Animation Graph Editors Rendering
Customize MAXScript Help
All
Bip01
Selection Level:
Sub-Object Trajecto
Parameters Tr
Assign Control
General
L: touch R:
1
0 / 100
483
484
485
banana.max - 3ds max 4
File Edit Tools Group Views Create Modifiers Animation Graph Editors Rendering
Customize MAXScript Help
All
Bip01
Selection Level:
Sub-Object Trajecto
Parameters Tr
Assign Control
General
L: touch R:
16
0 / 100
486

FIG. 4G. Cont.

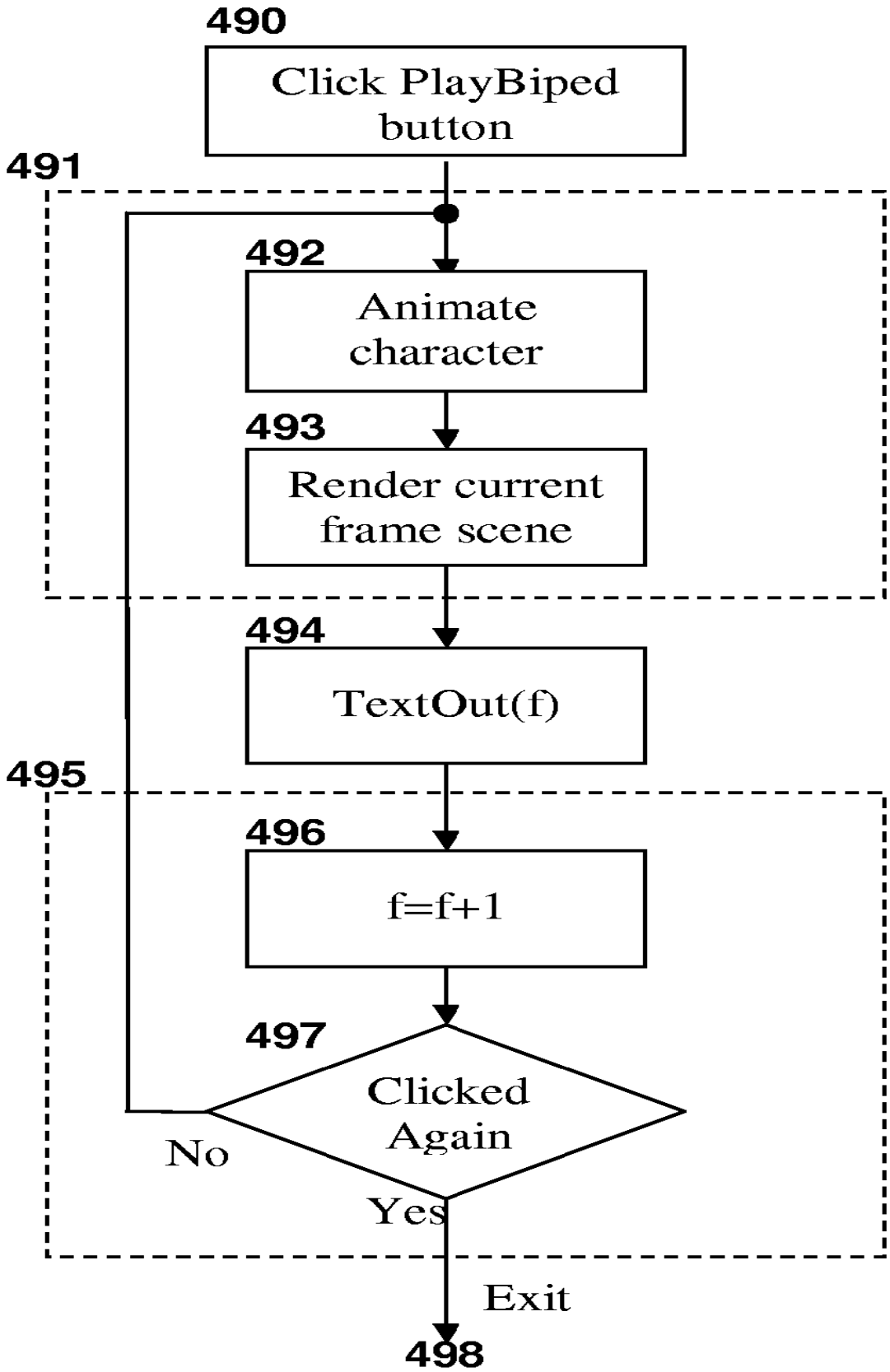

490
Click PlayBiped button
491
492
Animate character
493
Render current frame scene
494
TextOut(f)
495
496
f=f+1
497
Clicked Again
No
Yes
Exit
498

FIG. 4H

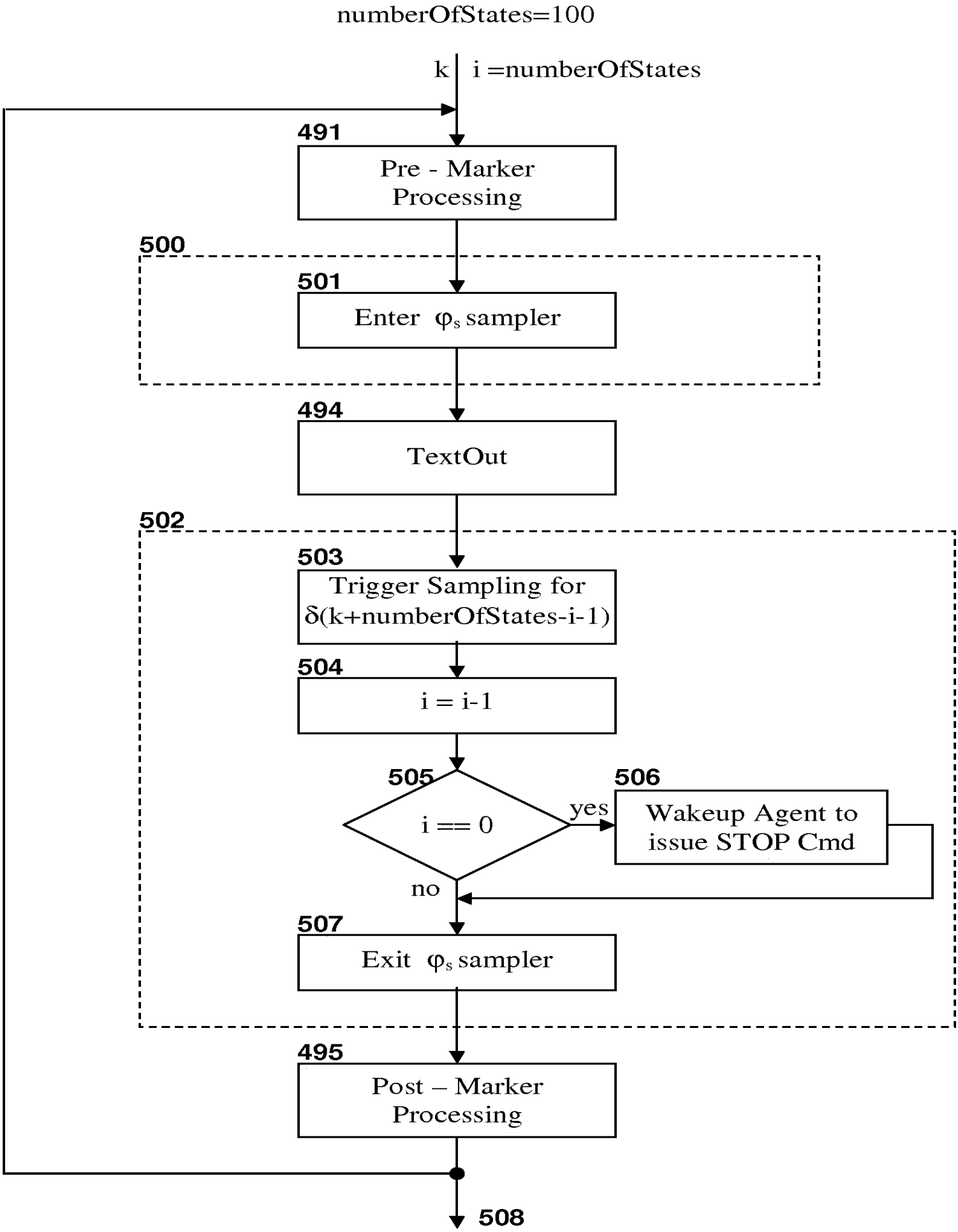
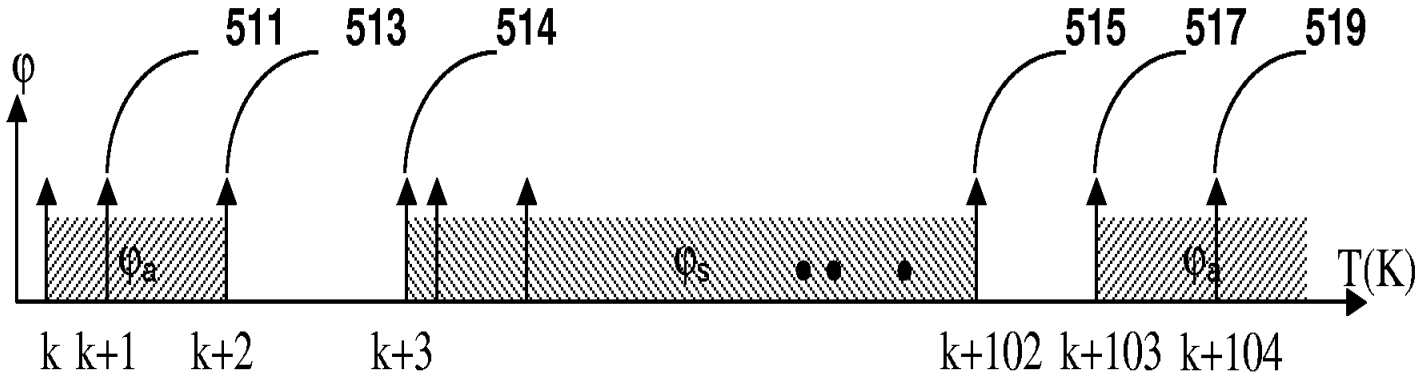

numberOfStates=100
k
i =numberOfStates
491
Pre - Marker Processing
500
501
Enter φs sampler
494
TextOut
502
503
Trigger Sampling for δ(k+numberOfStates-i-1)
504
i = i-1
505
i == 0
yes
506
Wakeup Agent to issue STOP Cmd
no
507
Exit φs sampler
495
Post – Marker Processing
508

FIG. 4H Cont.


φ
511
513
514
515
517
519
φa
φs
φa
T(K)
k
k+1
k+2
k+3
k+102
k+103
k+104

I
510
512
516
518
T(K)
k
k+1
k+102
k+103

FIG. 4I

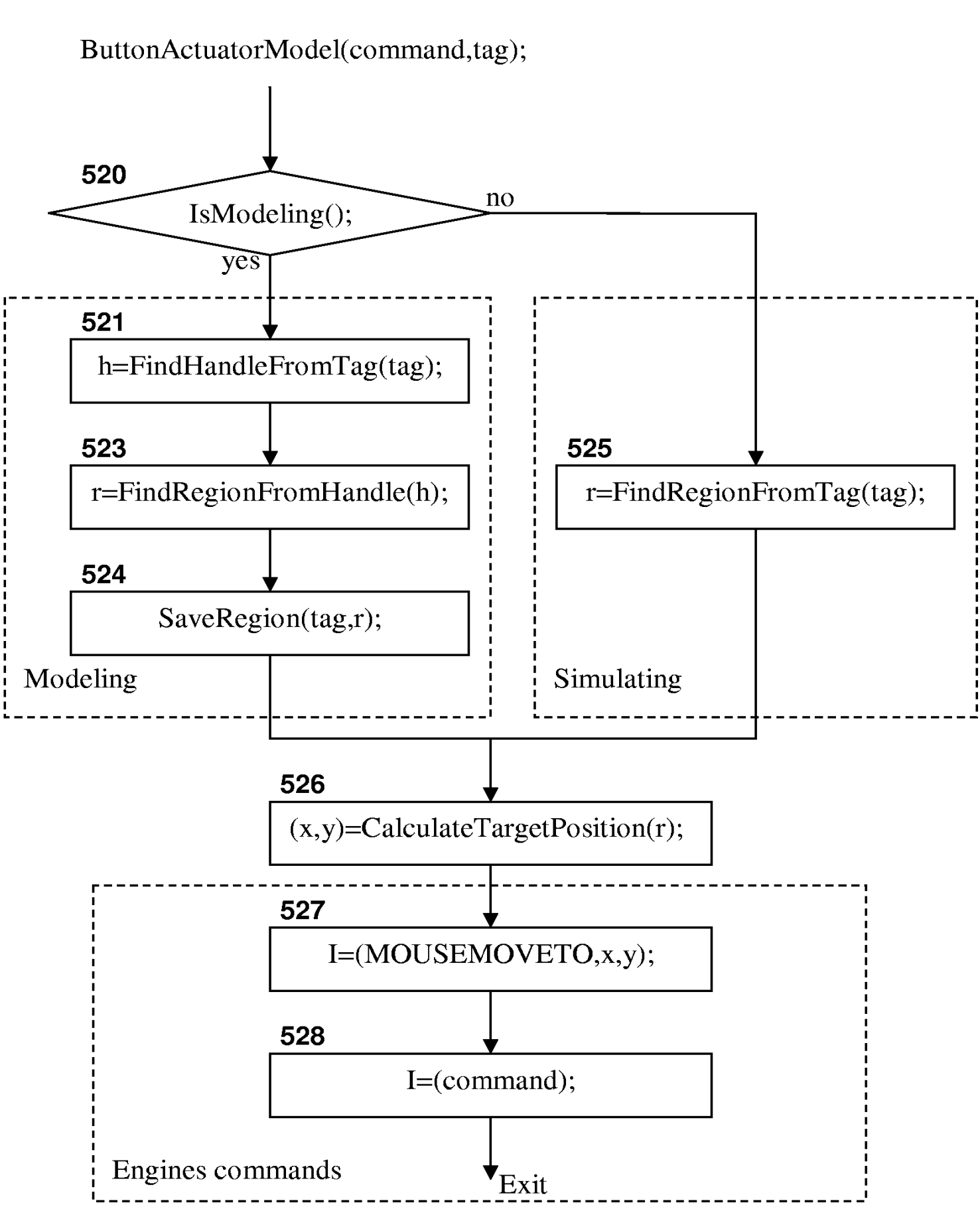

ButtonActuatorModel(command,tag);
520
IsModeling();
no
yes
521
h=FindHandleFromTag(tag);
523
r=FindRegionFromHandle(h);
524
SaveRegion(tag,r);
Modeling
525
r=FindRegionFromTag(tag);
Simulating
526
(x,y)=CalculateTargetPosition(r);
527
I=(MOUSEMOVETO,x,y);
528
I=(command);
Engines commands
Exit

FIG. 5A

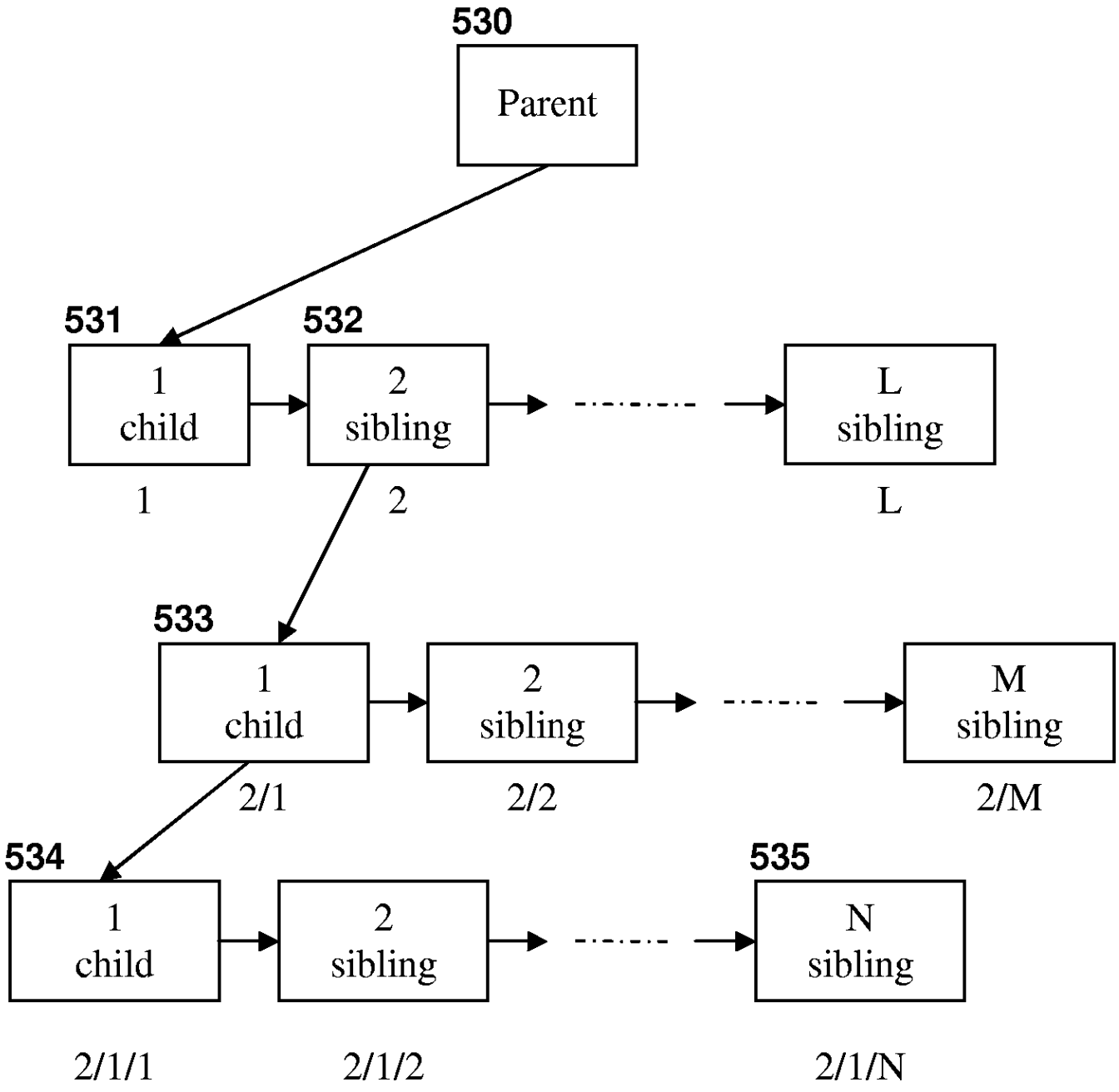

530
Parent
531
1
child
532
2
sibling
L
sibling
1
2
L
533
1
child
2
sibling
M
sibling
2/1
2/2
2/M
534
1
child
2
sibling
535
N
sibling
2/1/1
2/1/2
2/1/N

FIG. 5B

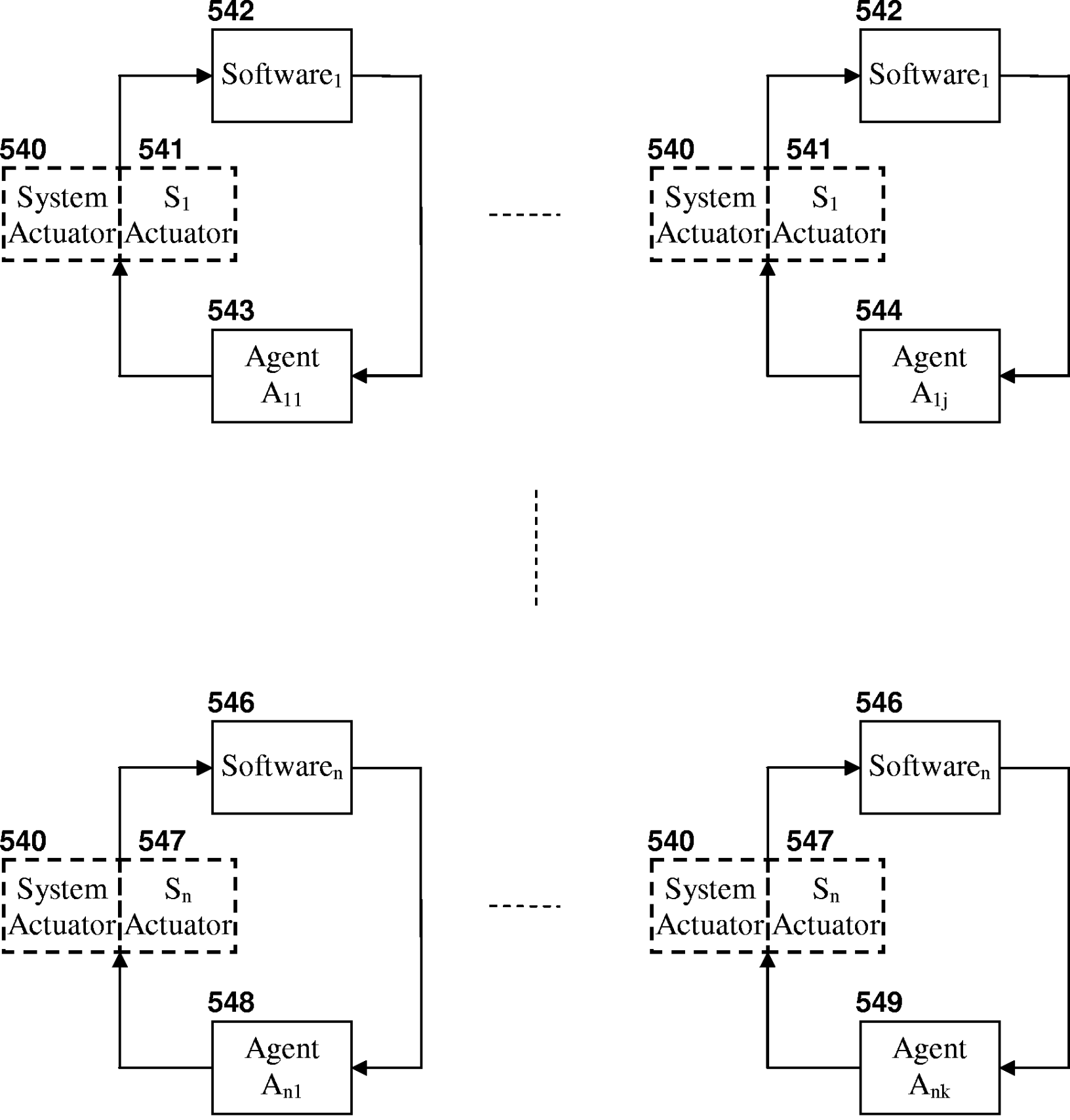

542
Software1
540
541
System Actuator
S1 Actuator
543
Agent A11
542
Software1
540
541
System Actuator
S1 Actuator
544
Agent A1j
546
Softwaren
540
547
System Actuator
Sn Actuator
548
Agent An1
546
Softwaren
540
547
System Actuator
Sn Actuator
549
Agent Ank

FIG. 5C

550

```
Public class PlayButtonActuator extends ButtonActuatorModel
{
```

551

```
  public PlayButtonActuator()
  {
        super("Play");
  }
```

552

```
  void playBiped(int numberOfStates)
  {
  Rectangle r;
        APIProbe ap=new APIProbe(this,numberOfStates);
        r=clickButton();
        ap.probe();
  }
```

553

555

554

```
  Rectangle clickButton()
  {
        return super.command(MOUSECLICK);
  }
  ...
}
```

FIG. 5D

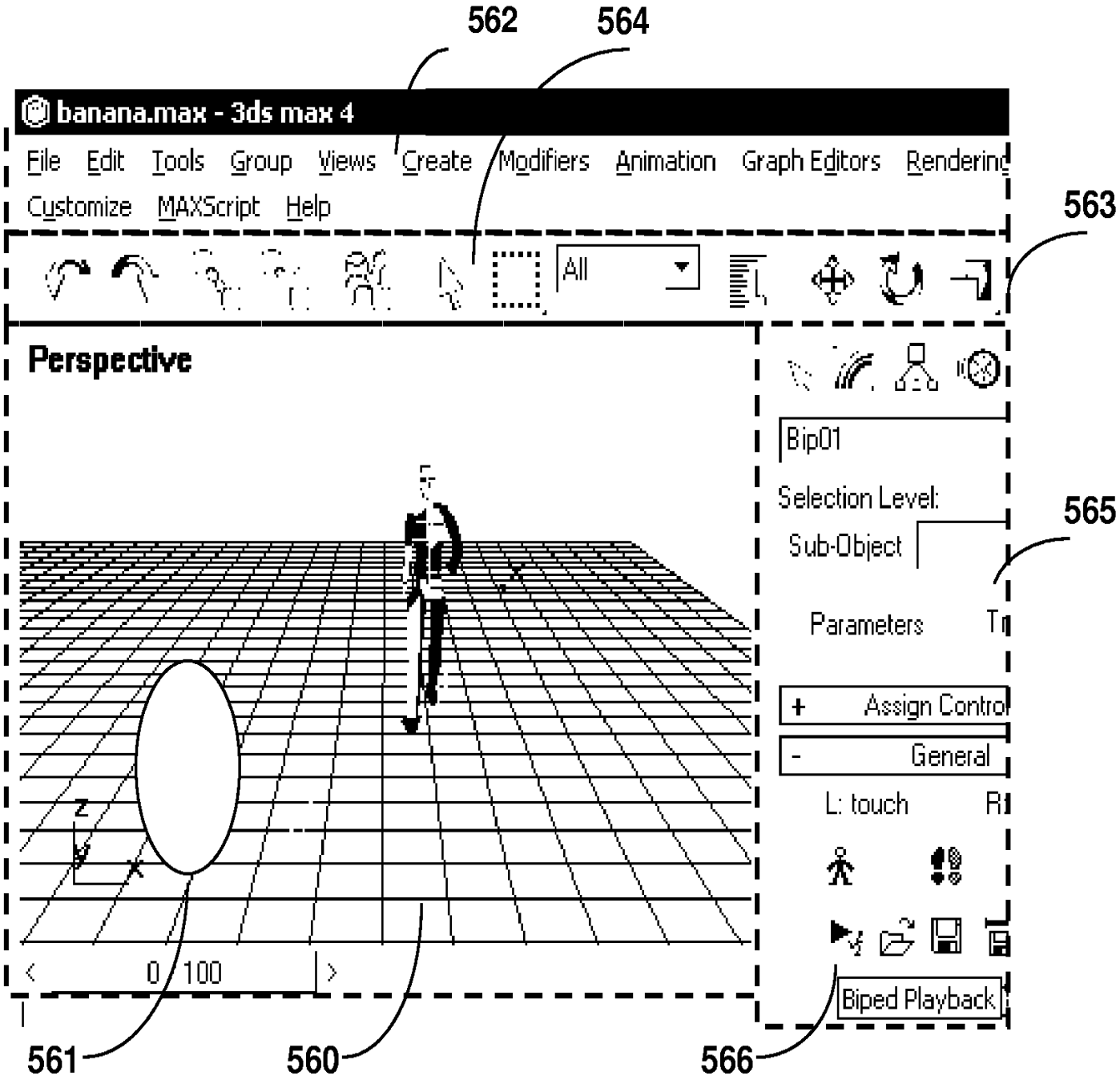

562
564
banana.max - 3ds max 4
File Edit Tools Group Views Create Modifiers Animation Graph Editors Rendering
Customize MAXScript Help
563
All
Perspective
Bip01
Selection Level:
Sub-Object
565
Parameters
+ Assign Control
- General
L: touch
Biped Playback
0 100
561
560
566

FIG. 5E

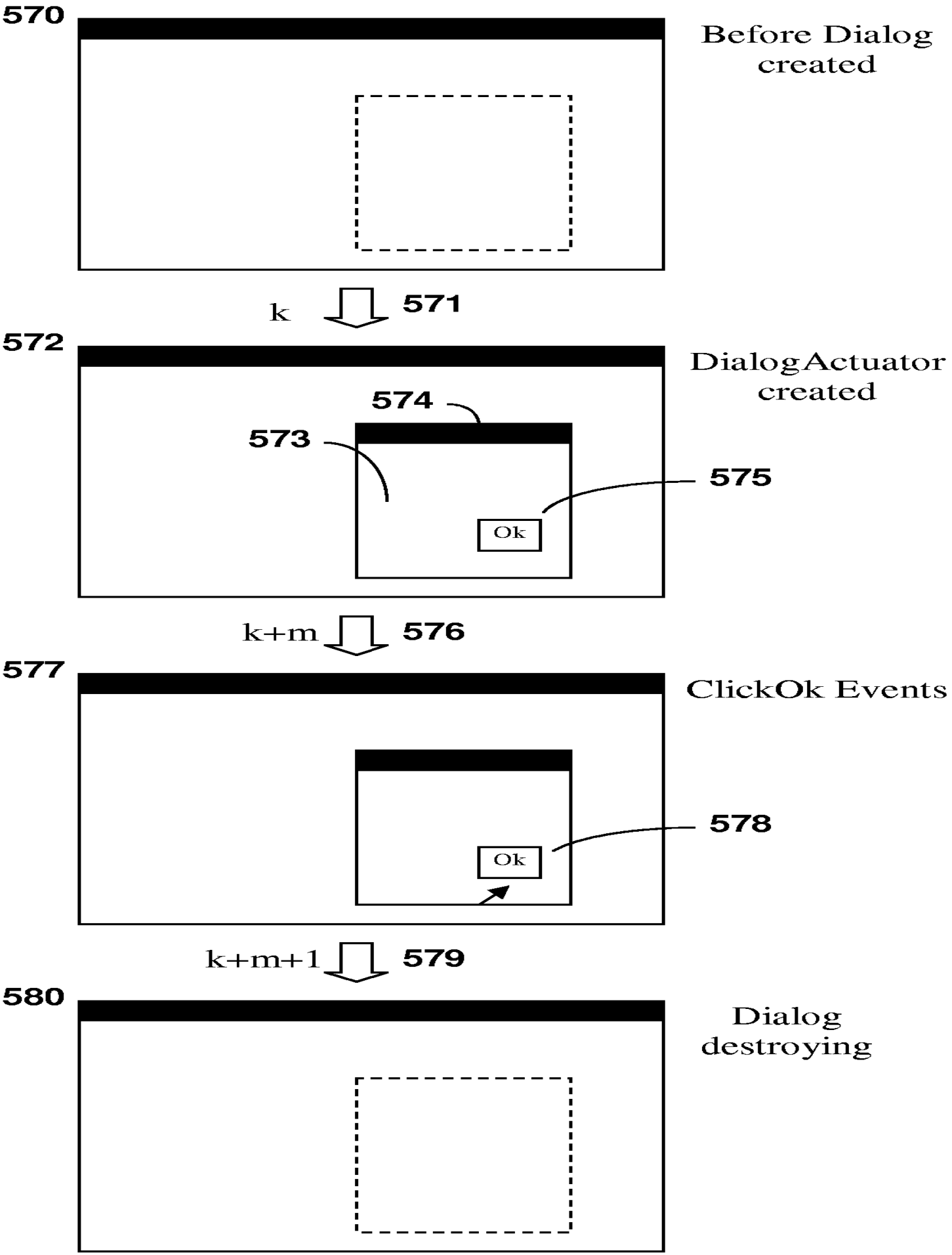

570
Before Dialog created
k
571
572
DialogActuator created
574
573
575
Ok
k+m
576
577
ClickOk Events
578
Ok
k+m+1
579
580
Dialog destroying

FIG. 5F

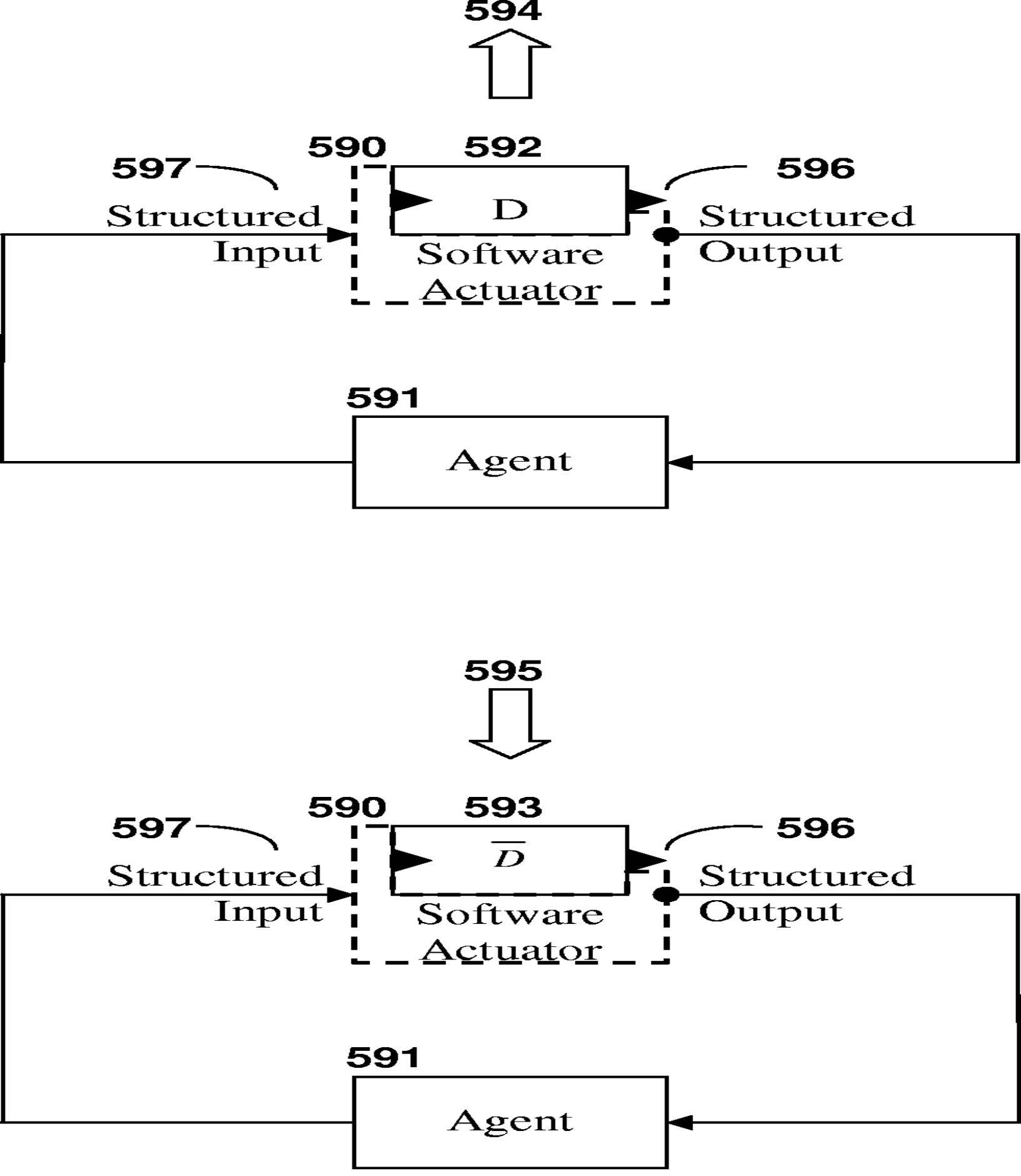

594
590
592
597
596
D
Structured
Input
Structured
Output
Software
Actuator
591
Agent
595
590
593
597
596
$\overline{D}$
Structured
Input
Structured
Output
Software
Actuator
591
Agent

FIG. 5G

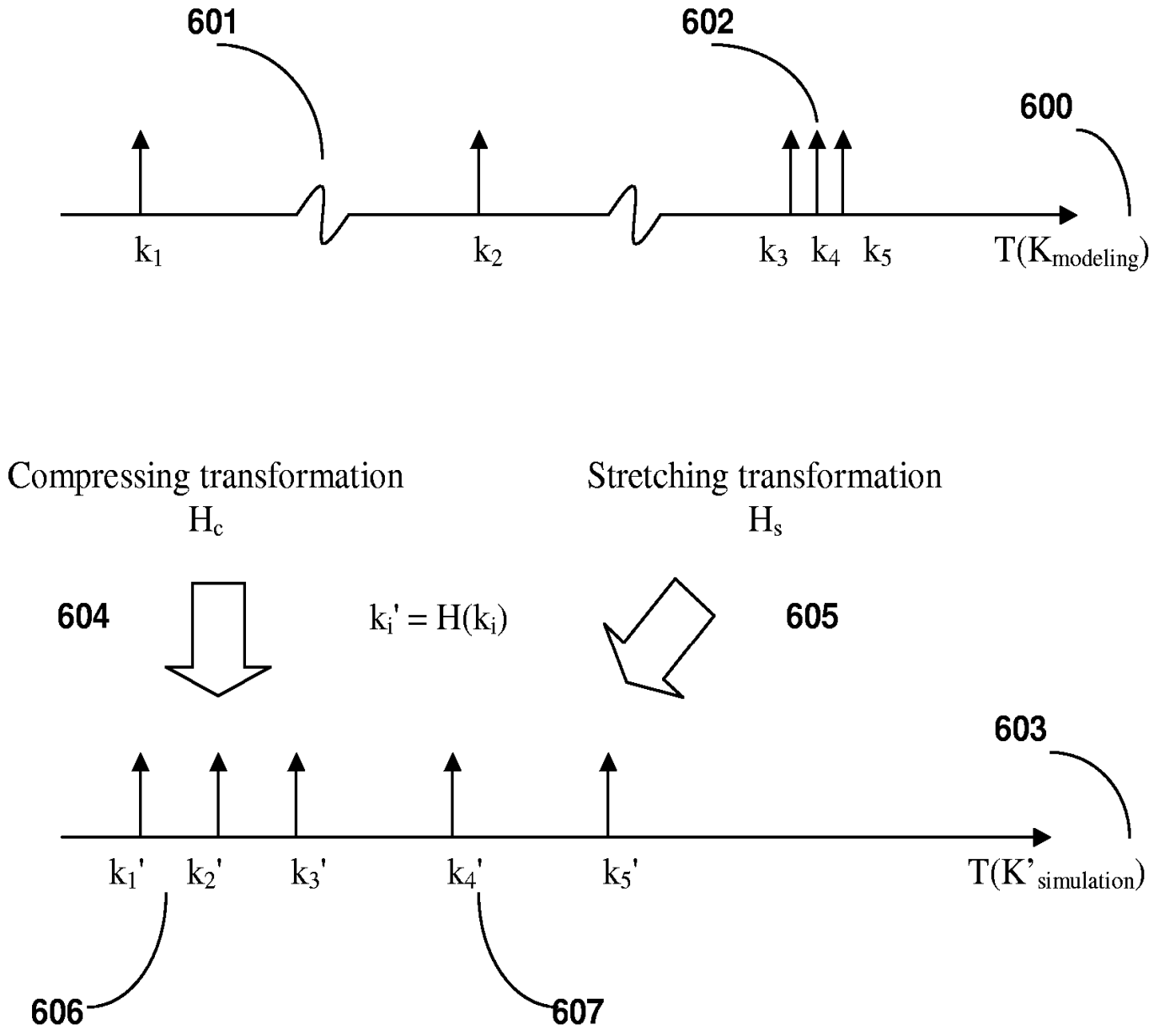

601
602
600
k_1
k_2
k_3 k_4 k_5
$T(K_{modeling})$
Compressing transformation
H_c
Stretching transformation
H_s
604
$k_i' = H(k_i)$
605
603
k_1' k_2' k_3' k_4' k_5'
$T(K'_{simulation})$
606
607

FIG. 6A

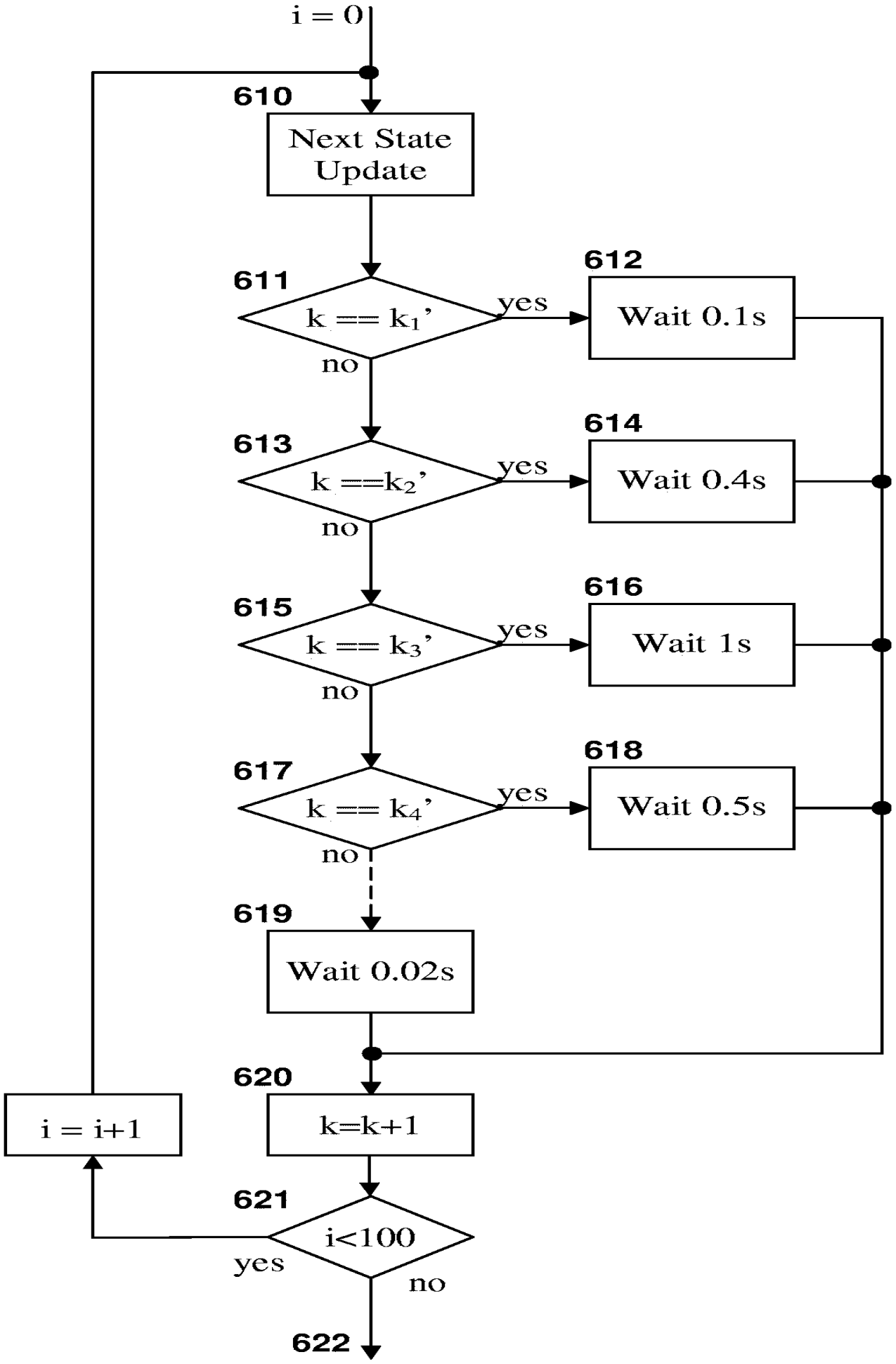

i = 0
610
Next State Update
611
k == k1'
yes
612
Wait 0.1s
no
613
k ==k2'
yes
614
Wait 0.4s
no
615
k == k3'
yes
616
Wait 1s
no
617
k == k4'
yes
618
Wait 0.5s
no
619
Wait 0.02s
620
k=k+1
i = i+1
621
i<100
yes
no
622

FIG. 6B

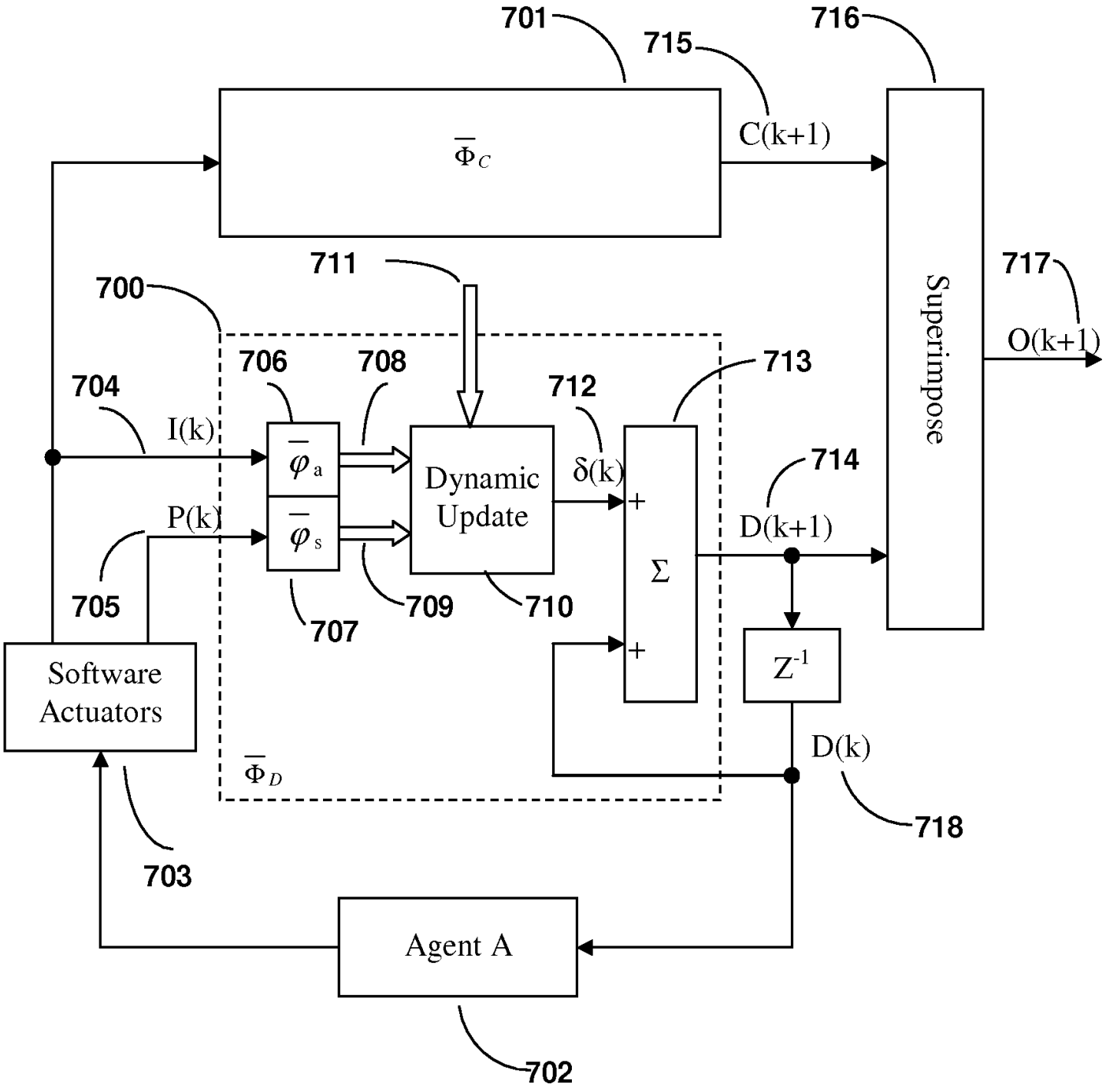
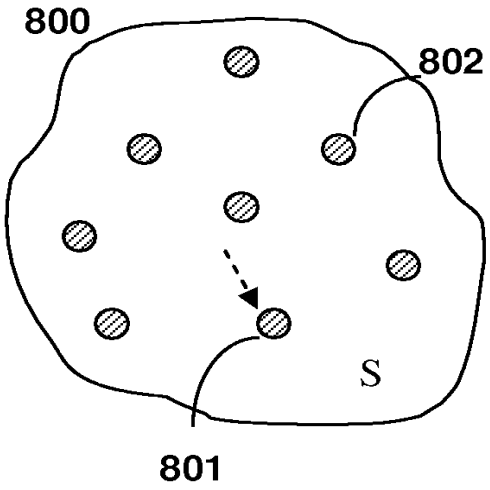
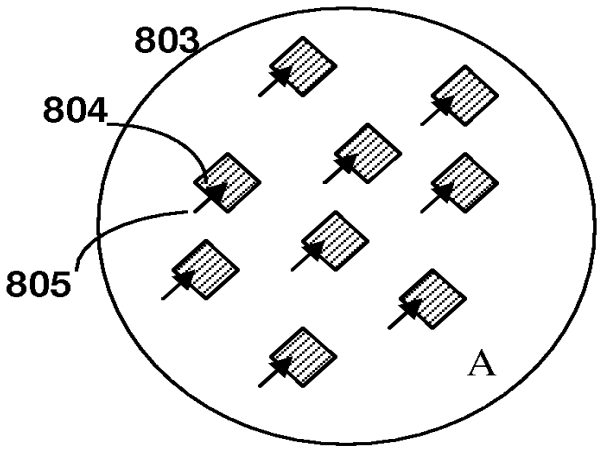
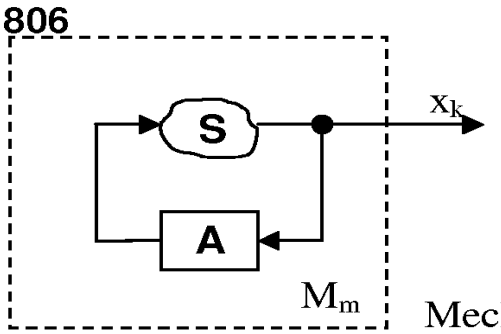

701
715
716
$\bar{\Phi}_C$
C(k+1)
Superimpose
717
O(k+1)
711
700
706
708
713
704
712
I(k)
$\bar{\varphi}_a$
Dynamic Update
δ(k)
714
P(k)
$\bar{\varphi}_s$
Σ
D(k+1)
705
709
710
707
Software Actuators
Z^{-1}
D(k)
$\bar{\Phi}_D$
718
703
Agent A
702

FIG. 7







Mechanization of modeling

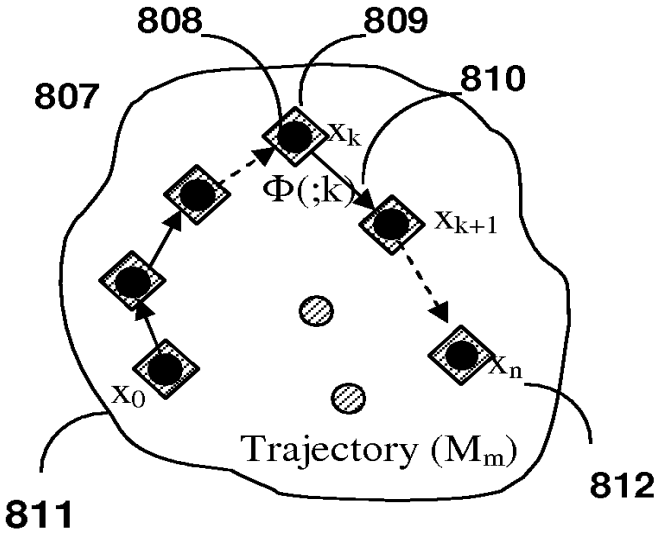
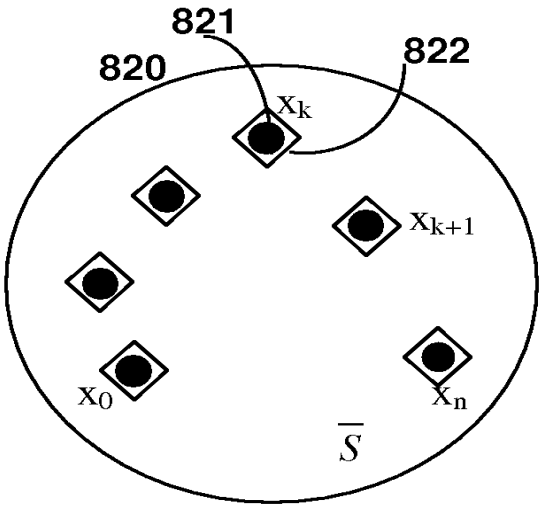
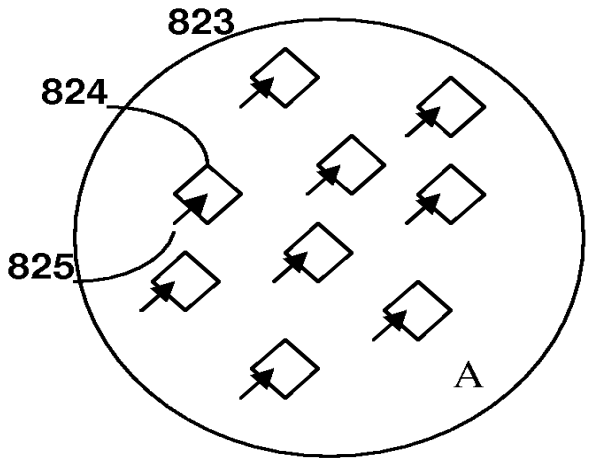
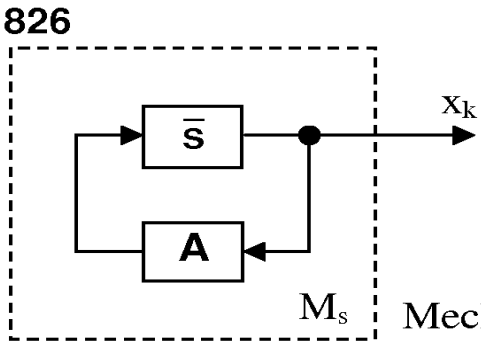


FIG. 8A







Mechanization of simulation

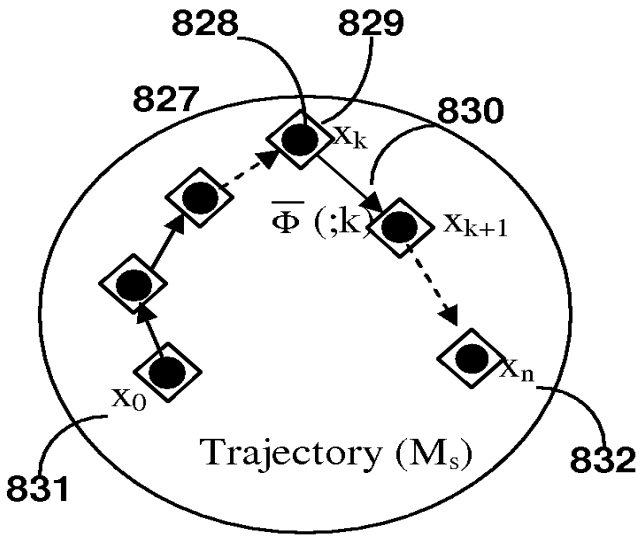
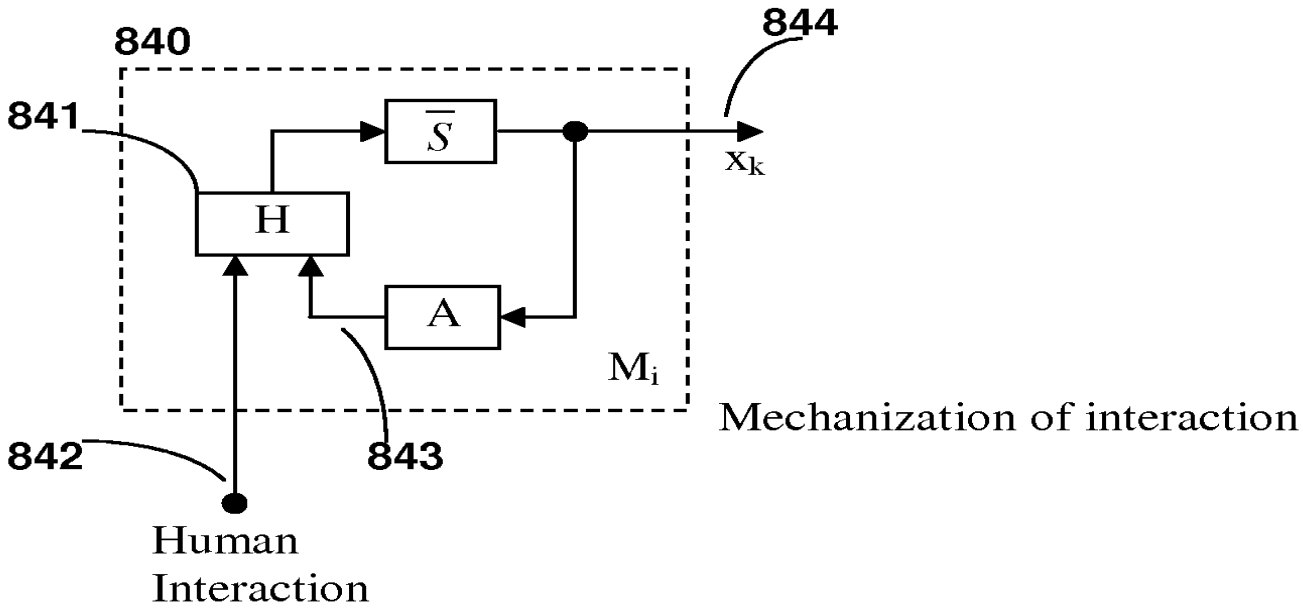


FIG. 8B


840
844
841
$\overline{S}$
x_k
H
A
M_i
Mechanization of interaction
842
843
Human
Interaction

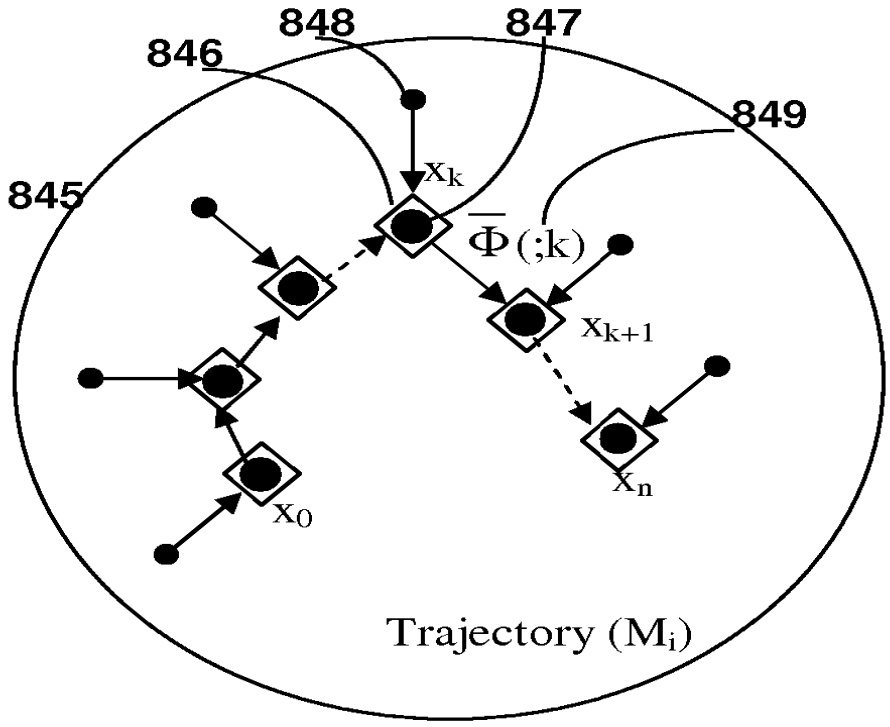
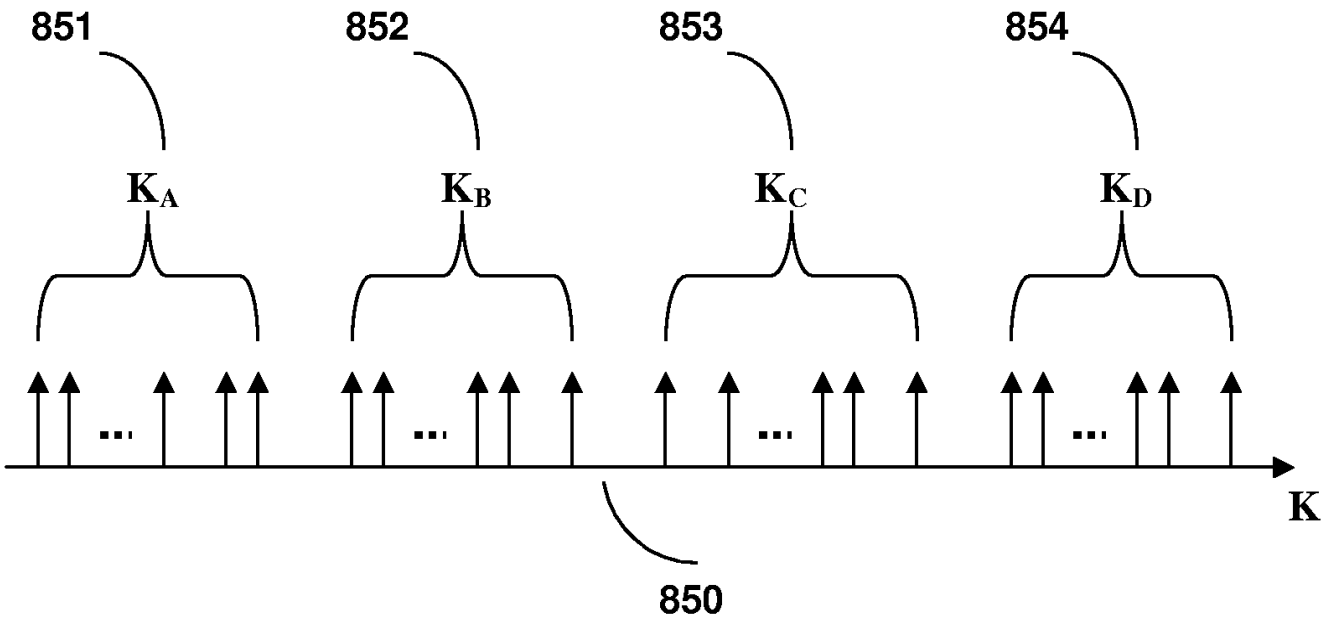

848
847
846
849
845
x_k
$\overline{\Phi}(;k)$
x_{k+1}
x_n
x_0
Trajectory (M_i)

FIG. 8C



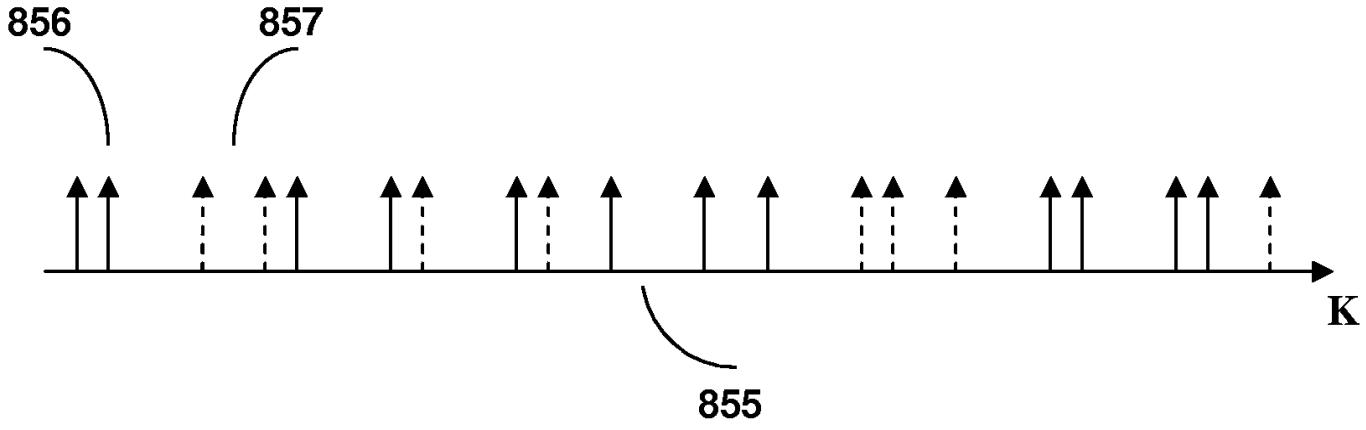
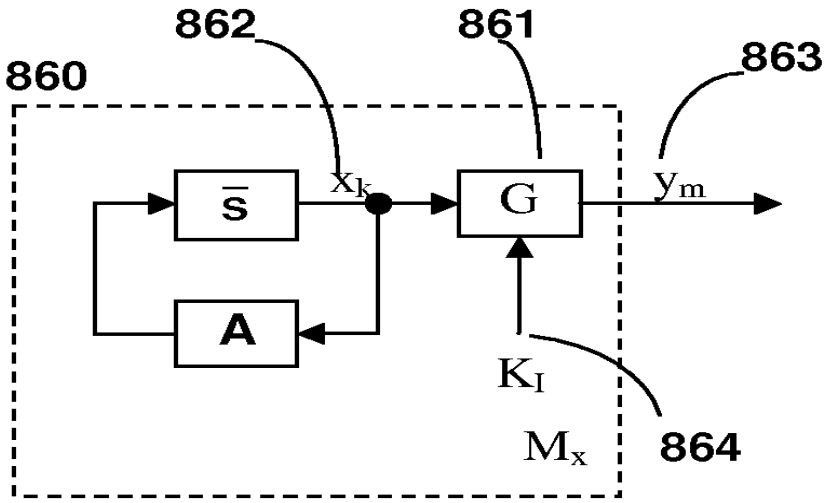


FIG. 8D



Mechanization of indexation

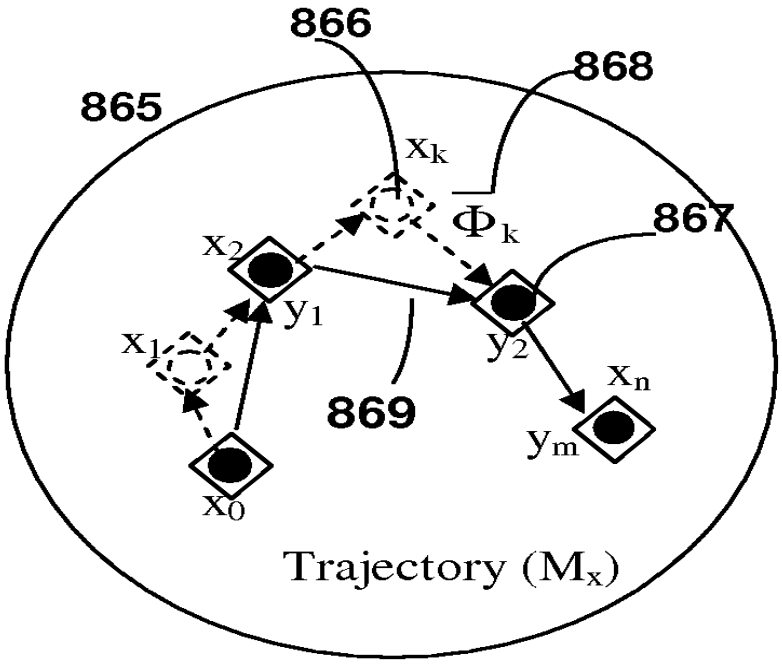
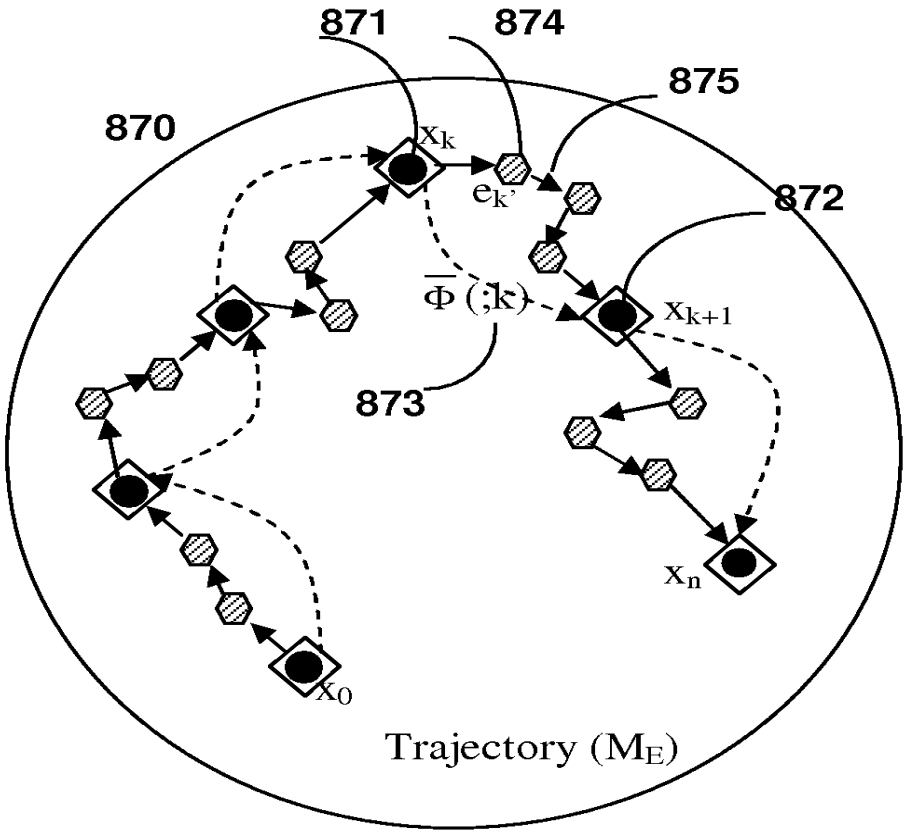
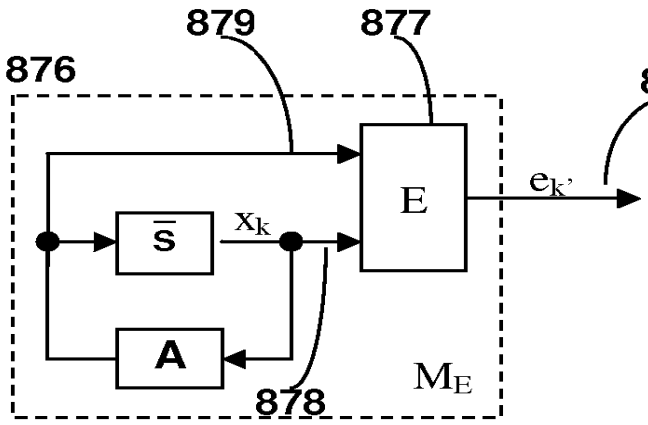
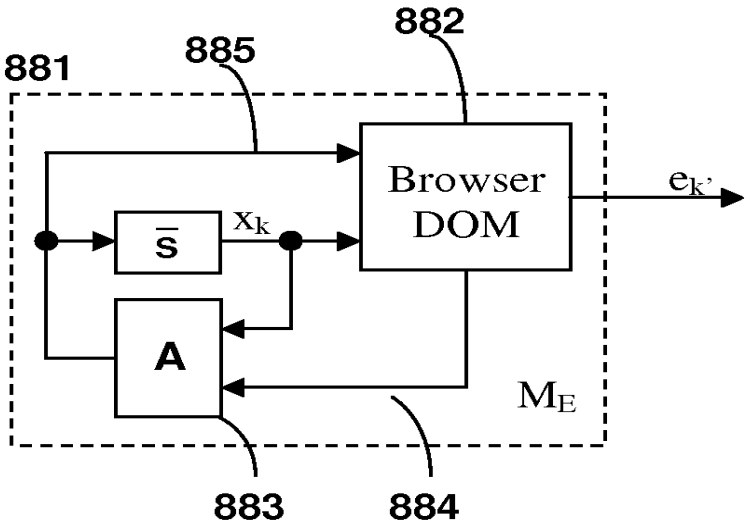


FIG. 8E





Mechanization of extension



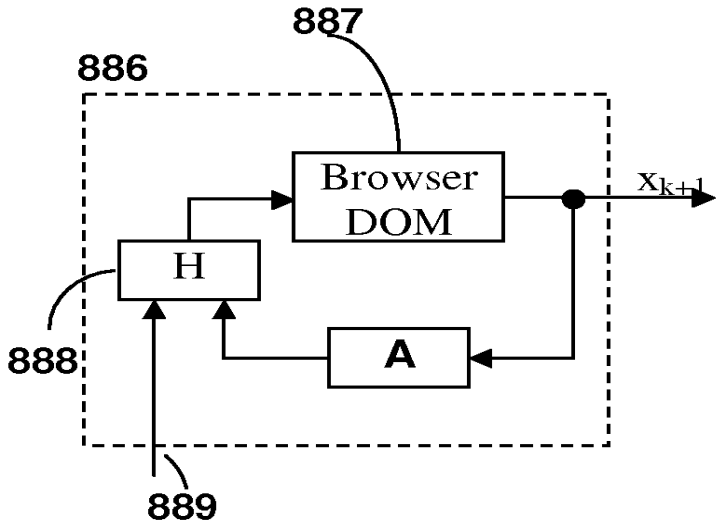


FIG. 8F

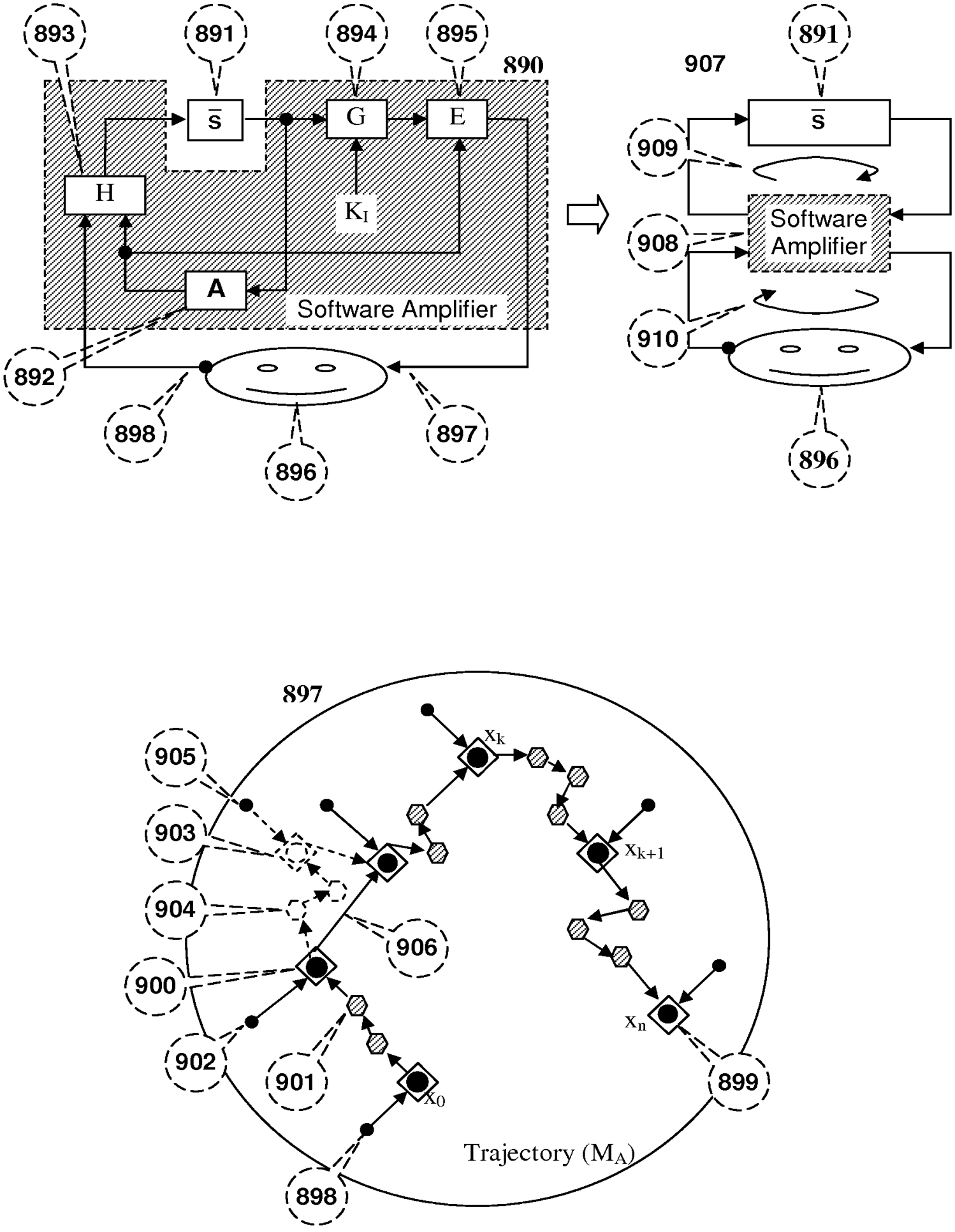

893
891
894
895
890
s̄
G
E
H
K_I
A
Software Amplifier
892
898
896
897
907
891
s̄
909
908
Software Amplifier
910
896
897
905
903
904
906
900
902
901
898
899
x_k
x_k+1
x_n
x_0
Trajectory (M_A)

FIG. 8G

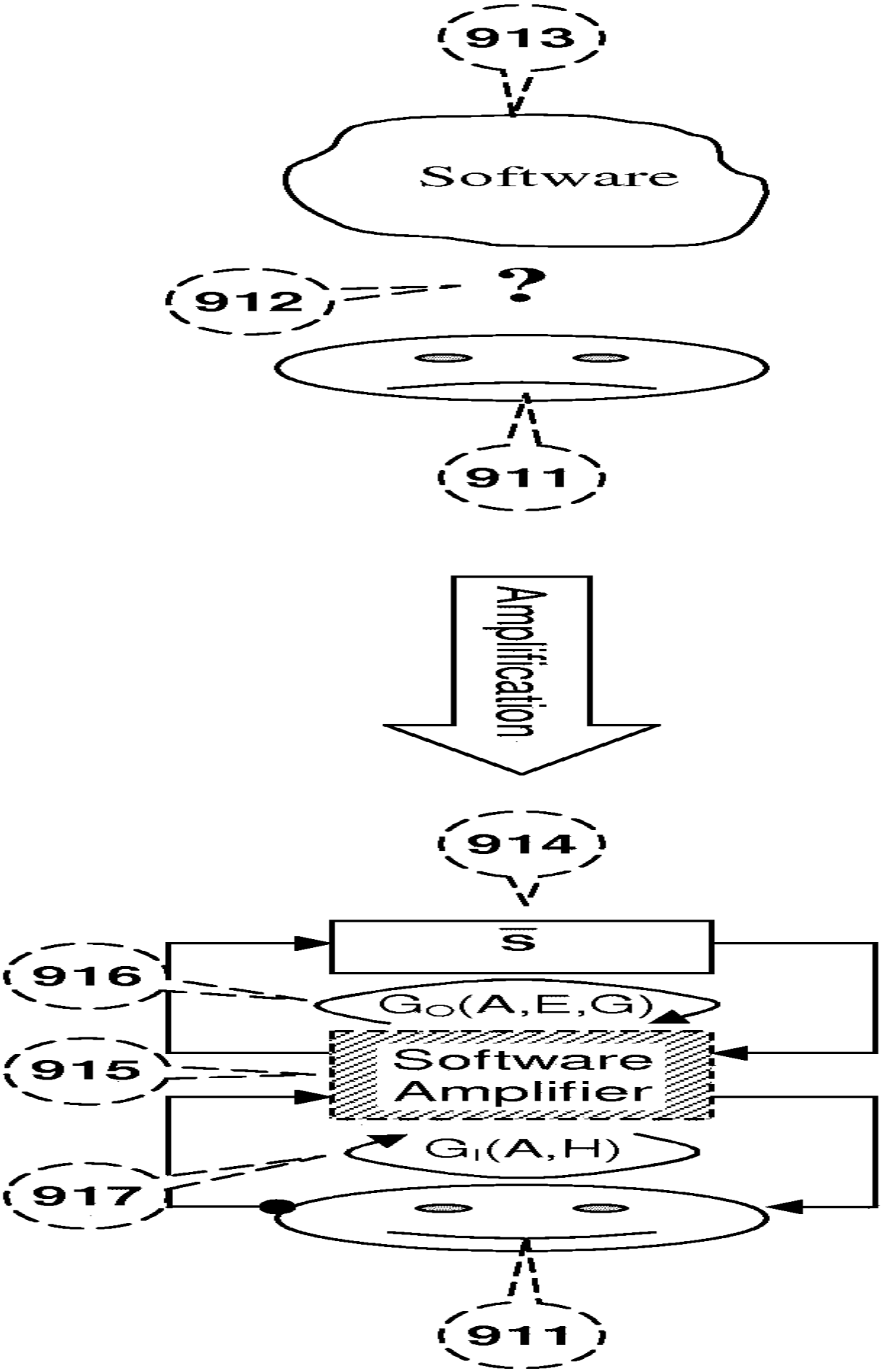

913
Software
912
?
911
Amplification
914
S
916
$G_O(A,E,G)$
915
Software
Amplifier
$G_I(A,H)$
917
911

FIG. 8H

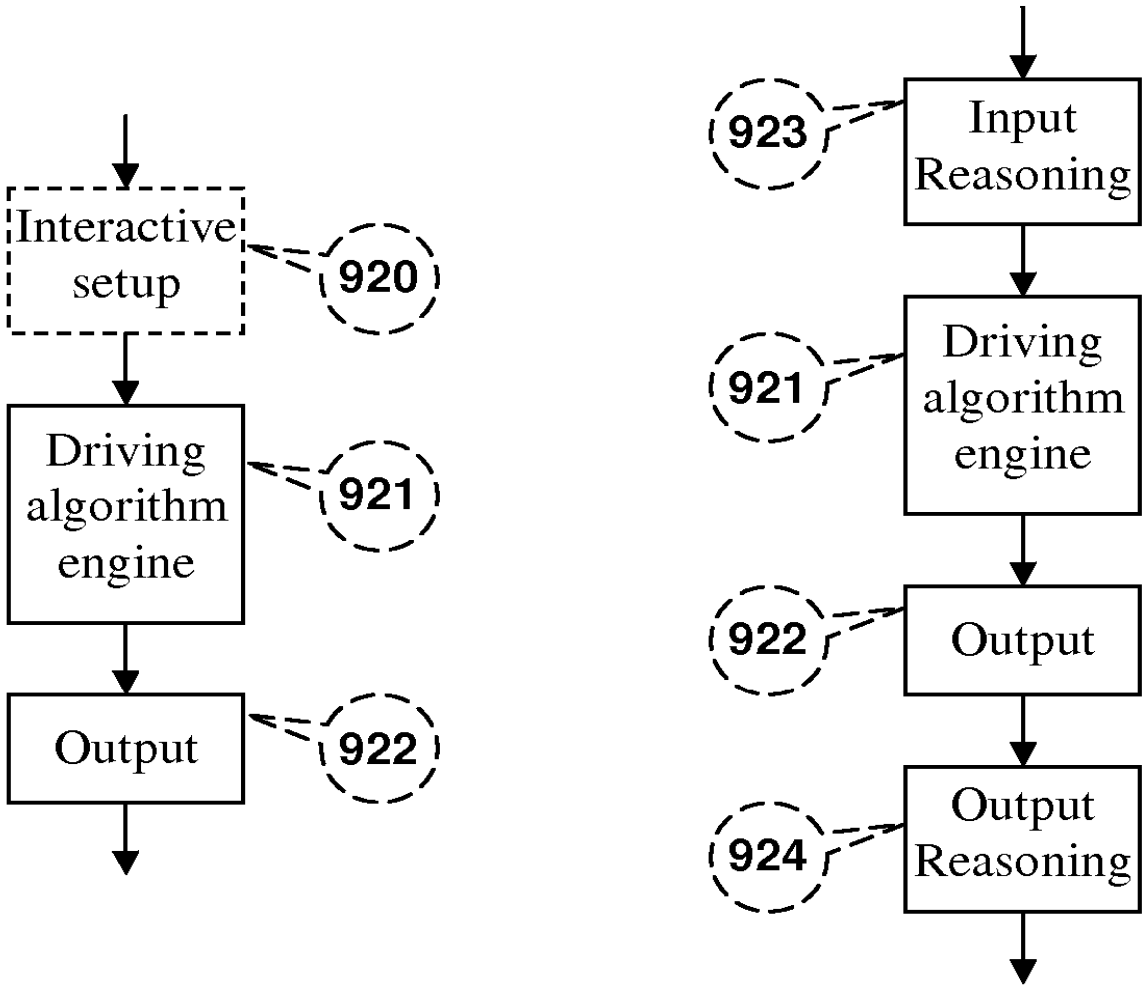

Interactive setup
920
Driving algorithm engine
921
Output
922
923
Input Reasoning
921
Driving algorithm engine
922
Output
924
Output Reasoning

FIG. 8I

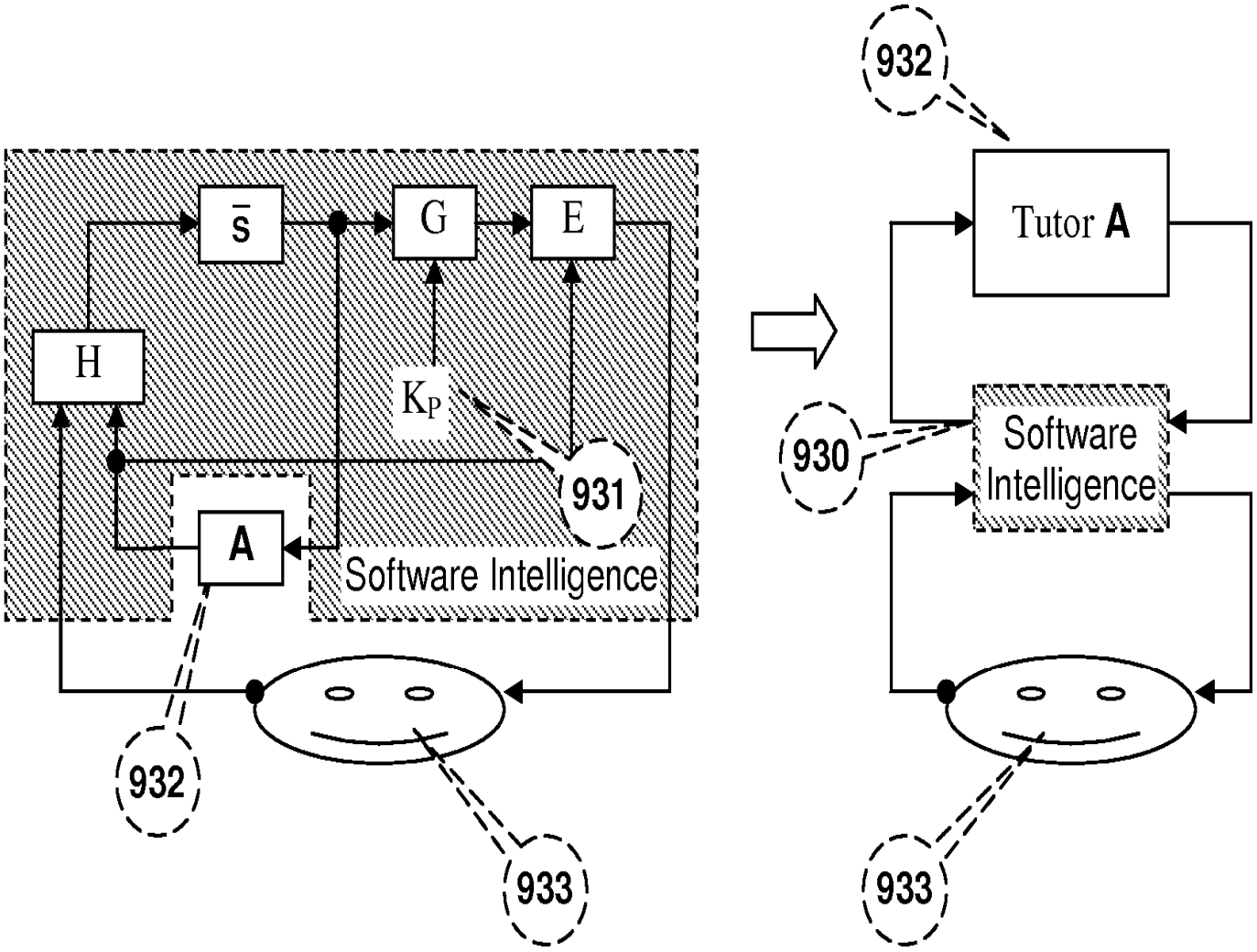

s̄
G
E
H
K_P
931
A
Software Intelligence
932
933
932
Tutor A
930
Software Intelligence
933

FIG. 8J

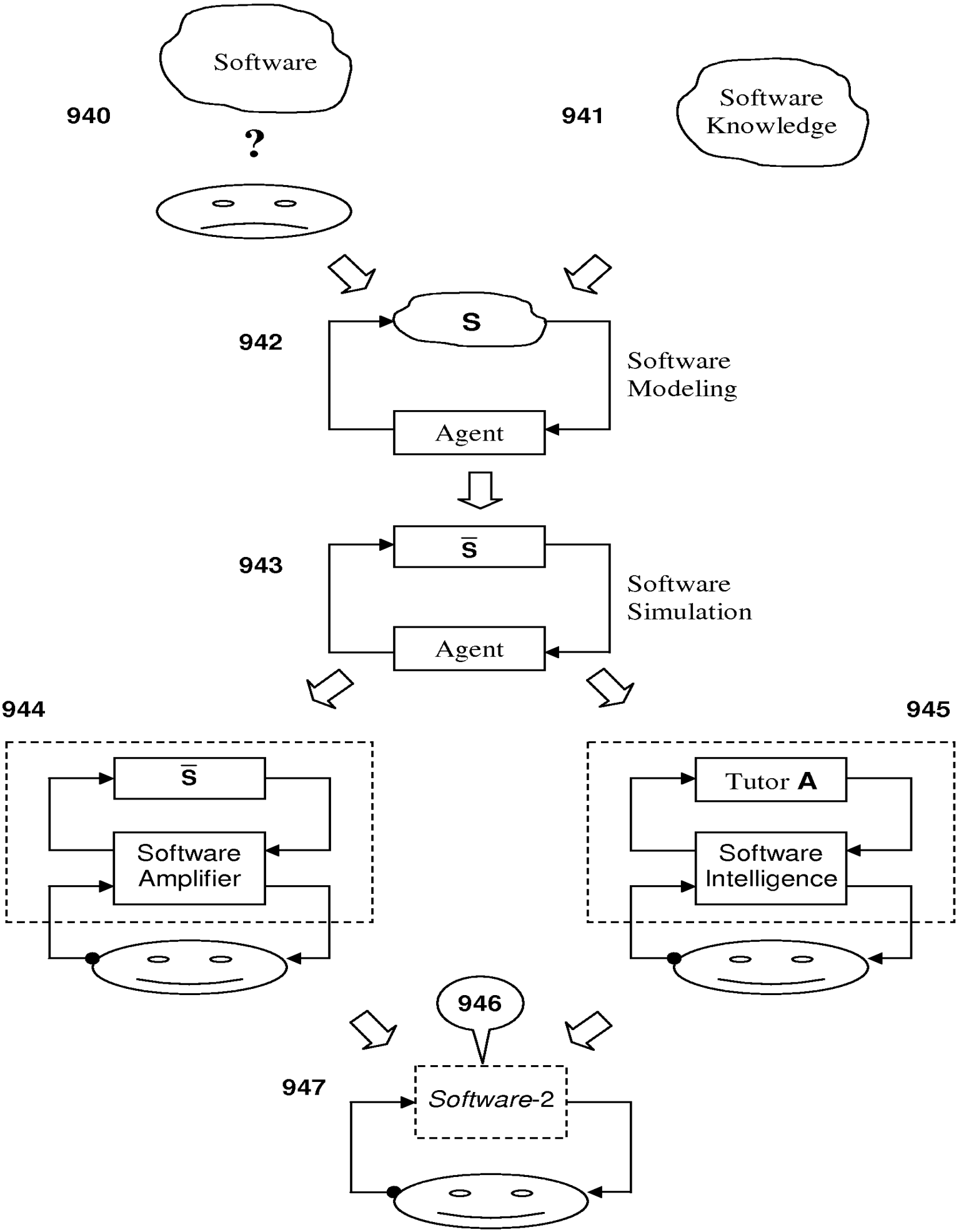

Software
940
?
941
Software Knowledge
942
S
Software Modeling
Agent
943
S̄
Software Simulation
Agent
944
945
S̄
Software Amplifier
Tutor A
Software Intelligence
946
947
Software-2

FIG. 9A

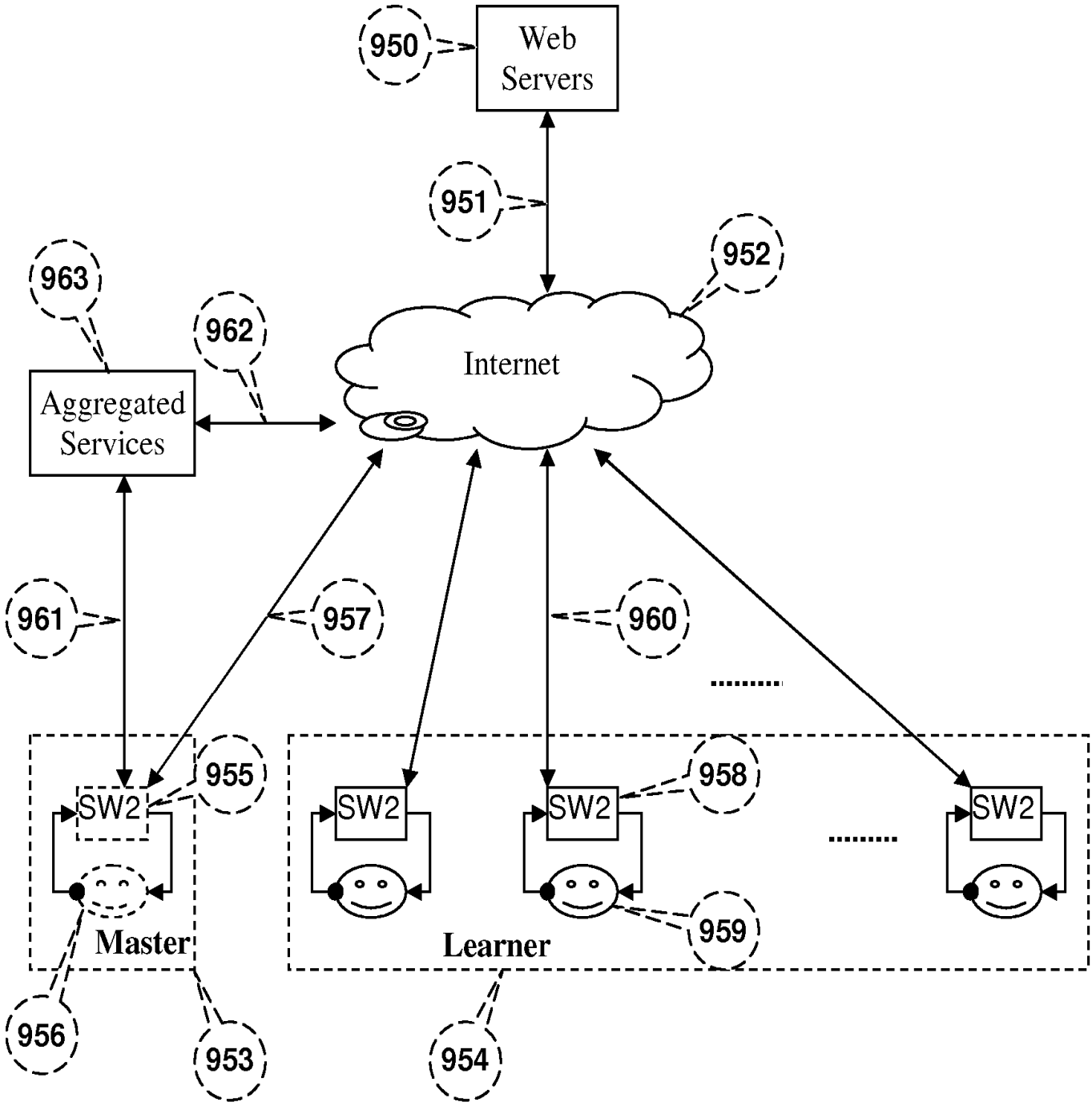

950
Web Servers
951
952
963
962
Internet
Aggregated Services
961
957
960
955
SW2
SW2
SW2
SW2
958
959
Master
Learner
956
953
954

FIG. 9B

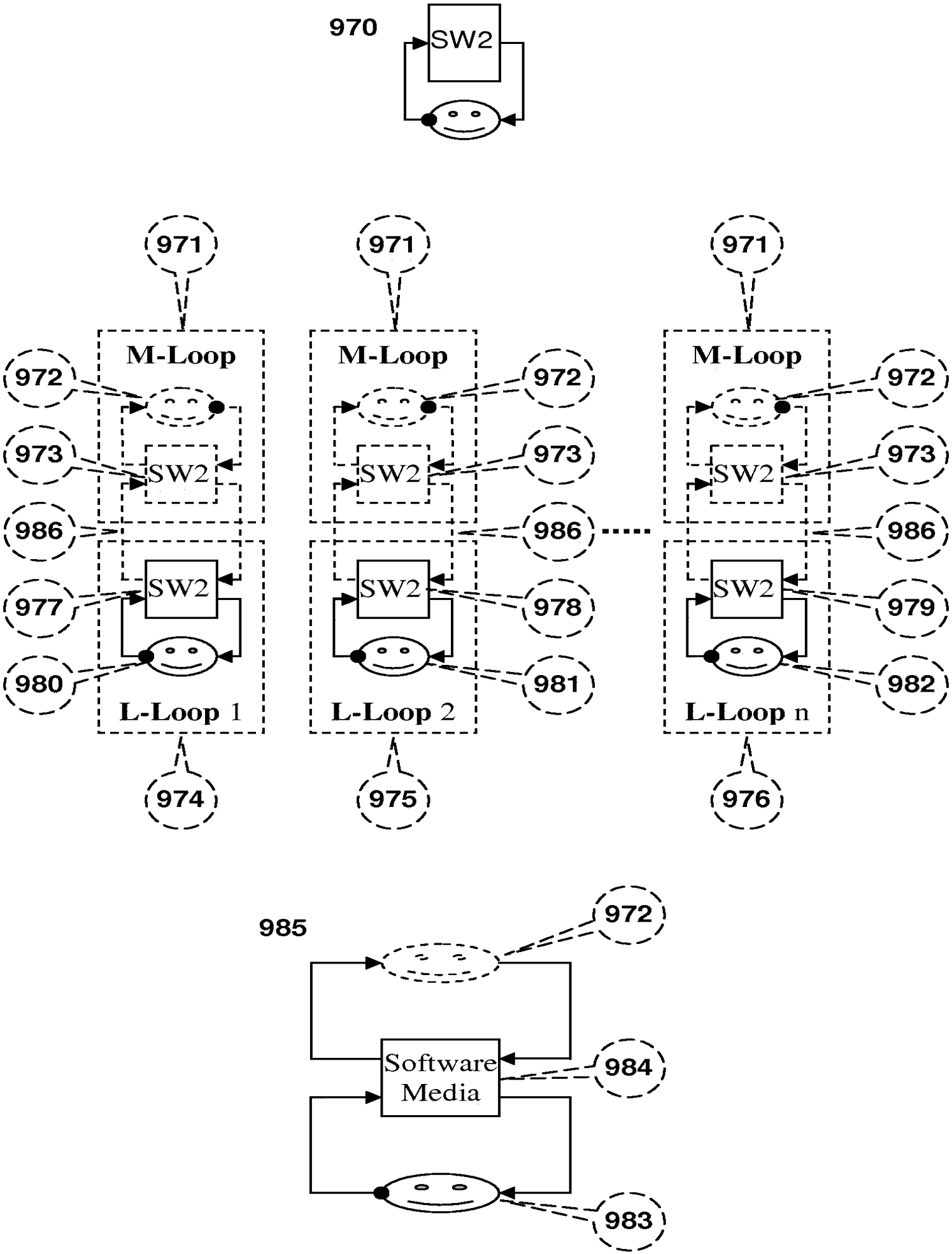

970
SW2
971
971
971
M-Loop
M-Loop
M-Loop
972
972
972
973
973
973
SW2
SW2
SW2
986
986
986
977
978
979
980
981
982
L-Loop 1
L-Loop 2
L-Loop n
974
975
976
985
Software
Media
984
983

FIG. 9C

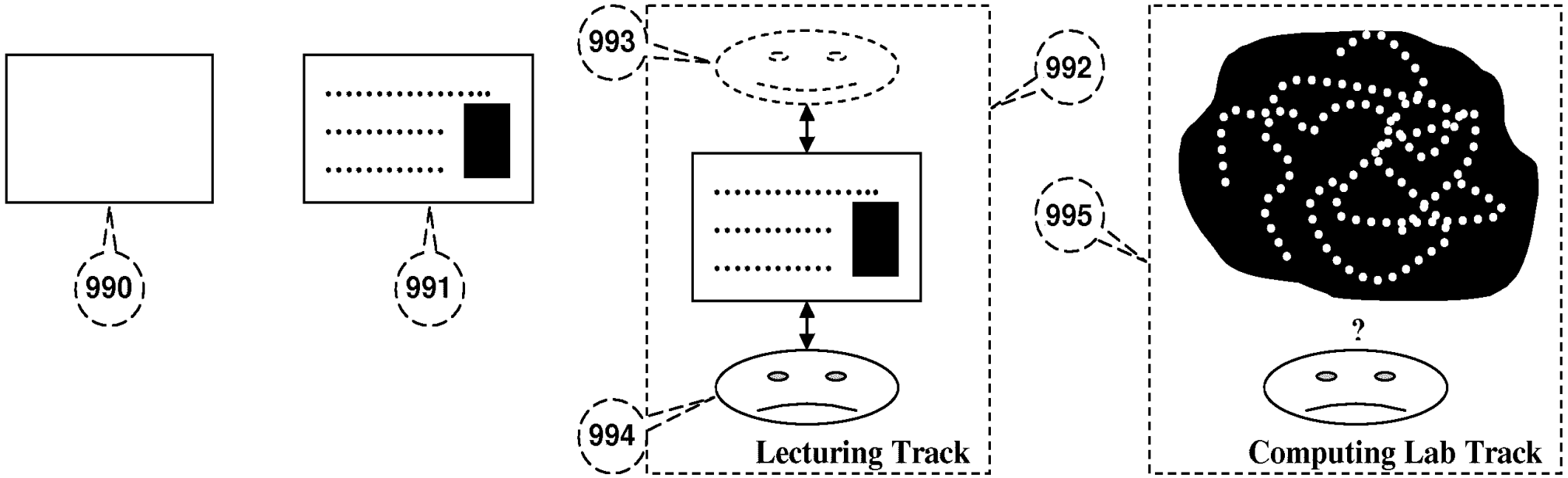
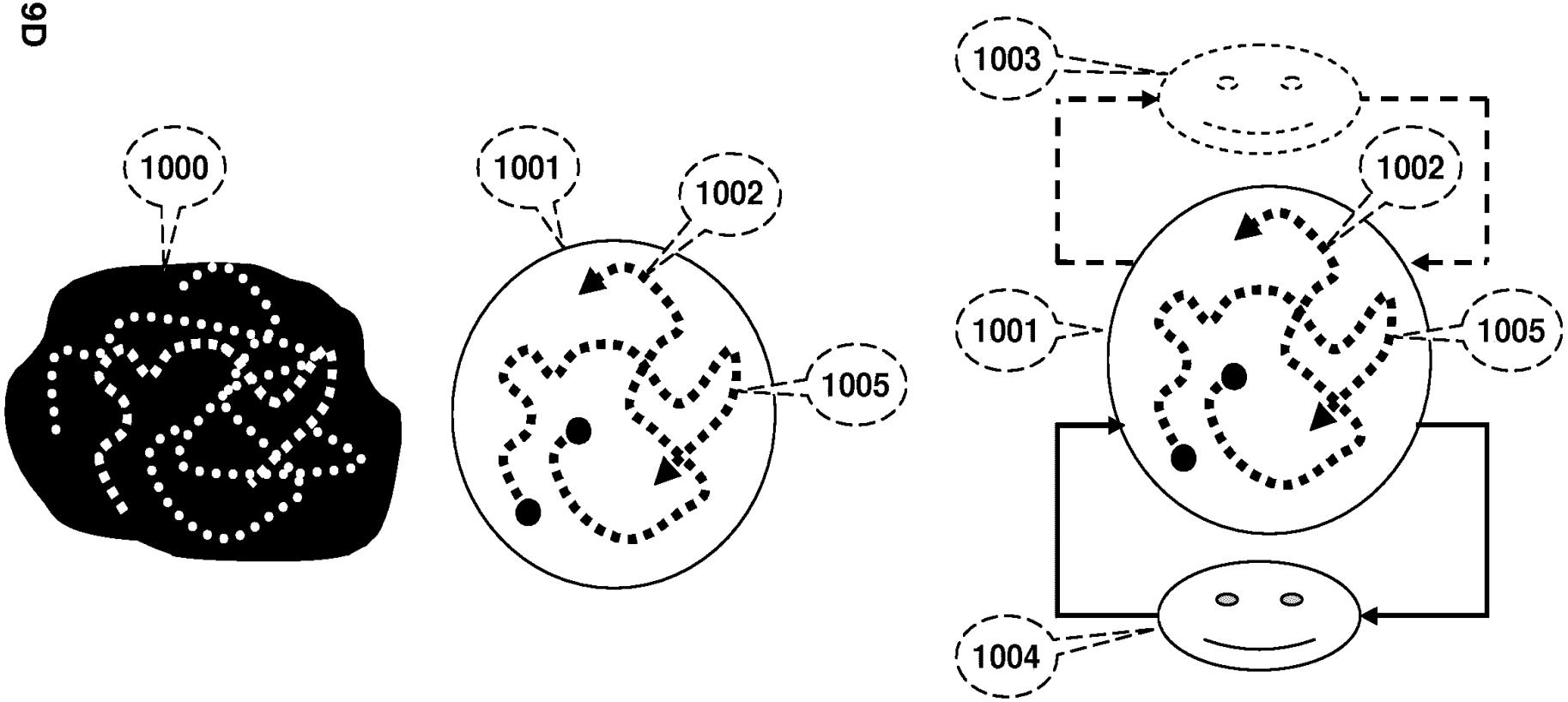

990
991
993
992
995
994
Lecturing Track
?
Computing Lab Track

FIG. 9D


1000
1001
1002
1005
1003
1002
1001
1005
1004